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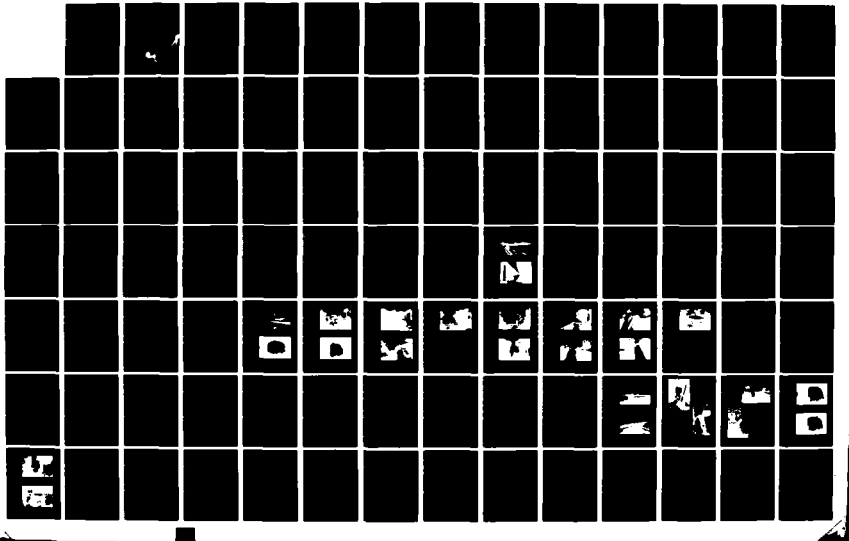

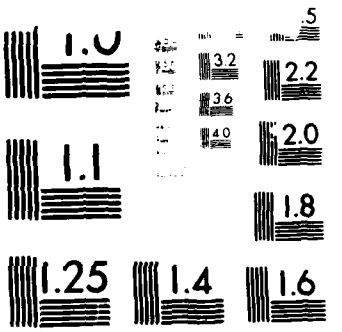
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UNDERWATER FACILITIES INSPECTIONS & ASSESSMENTS

(1)

PIERS 2, 7 AND 9

U. S. NAVAL STATION, SAN DIEGO, CALIFORNIA

FPO-1-84(23) DECEMBER 1984

OCEAN ENGINEERING AND CONSTRUCTION PROJECT OFFICE
CHESAPEAKE DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
WASHINGTON, D.C. 20374

UNDERWATER FACILITIES

INSPECTIONS

AND

ASSESSMENTS

AT

PIERS 2, 7 AND 9

U. S. NAVAL STATION, SAN DIEGO, CALIFORNIA

FPO-1-84(23) DECEMBER 1984

PERFORMED FOR:

OCEAN ENGINEERING AND CONSTRUCTION PROJECT OFFICE
CHESAPEAKE DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
WASHINGTON, D.C. 20374

CONTRACT: N62477-83-D-0190-0002
TASK 2

BY: BLAYLOCK-WILLIS AND ASSOCIATES, ENGINEERS
1909 MC KEE STREET, SAN DIEGO, CALIFORNIA 92110

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19. ABSTRACT (Continue on reverse if necessary & identify by block number)
An inspection was made of three facilities belonging to the Naval Station, San Diego, California during the period between August 21 and September 11, 1984. The principal object was to provide that quality of inspection that would allow the engineer inspectors/divers to assess the general physical (Con't)

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condition of the piling of the Piers inspected using non-destructive techniques. Typical and critical elements were photographed.

The facilities inspected and recommendations regarding each of them are as follows: 1) Pier 2 is new and was found to be as expected - in excellent condition. Two piles were found with cracks which presently have little significance or effect on structural integrity. 2) Pier 7 is generally in very good condition, however, nine piles at eight locations were found broken seriously enough to consider them incapable of sustaining load. In addition, two broken piles at Bents 25 and 26 have replaced with new piles. At Bent 27, both the original and replacement are broken. A design contract for the replacement of the broken piles was placed at the recommendation of ChesDiv. soon after the debriefing. A repair contract is proceeding as of this writing. 3) Pier 9 at the Naval Training Center is in need of repairs. Seven wooden piles were found which require replacement. Two concrete piles were found which are broken and candidates for replacement. It is estimated that the concrete piles will cost $28,100 to replace.

EXECUTIVE SUMMARY

An inspection was made of three facilities belonging to the Naval Station, San Diego, California during the period between August 21 and September 11, 1984.

The principal object was to provide that quality of inspection that would allow the engineer inspectors/divers to assess the general physical condition of the piling of the Piers inspected using non-destructive techniques. Typical and critical elements were photographed.

The facilities inspected and recommendations regarding each of them are as follows:

1. Pier 2 is new and was found to be as expected - in excellent condition. Two piles were found with cracks which presently have little significance or effect on structural integrity.

2. Pier 7 is generally in very good condition, however, nine piles at eight locations were found broken seriously enough to consider them incapable of sustaining load. In addition, two broken piles at Bents 25 and 26 have been replaced with new piles. At Bent 27, both the original and replacement are broken. A design contract for the replacement of the broken piles was placed at the recommendation of ChesDiv. soon after the debriefing. A repair contract is proceeding as of this writing.

3. Pier 9 at the Naval Training Center is in need of repairs. Seven wooden piles were found which require replacement. Two concrete piles were found which are broken and candidates for replacement. It is estimated that the concrete piles will cost $28,100 to replace.

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EXECUTIVE

FACILITY	YEAR BUILT OR MODIFIED	NO. & TYPES OF PILE IN STRUCTURE	SIZ (AREA) FT^2
Pier 2	1979	532 Concrete bearing	138,500
Pier 7	1974	624 Concrete bearing	125,800
Pier 9	1973 Repaired	84 Wood bearing 5 Wood guide 44 Concrete bearing	4,564

AL STATION

GO, CALIFORNIA

E SUMMARY TABLE

ZE (LENGTH) FT.	STRUCTURE	RECOMMENDATIONS	TOTAL REPAIR COST $
	20" Square P/S Concrete	None	
	18" Octagonal P/S Concrete	Replace 11 broken piles	
	14" Dia. Wood 14" Dia. Wood 14" Dia. Sq. Conc.	Repair/Replace wood and concrete piles	$70,100

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SECTION 1 - INTRODUCTION

1.1 CONTRACT DATA

Contract N62477-83-D-0190-0002 - Ocean Engineering Services in Support of Underwater Assessments at Various Locations.

This task required engineering services to document an underwater inspection and subsequently assess the integrity of the structural members supporting the waterfront facilities at the Naval Station, San Diego, California.

1.2 INTRODUCTION TO THE PROJECT

This inspection and assessment has been prepared under the Underwater Inspection Program conducted by the Ocean Engineering and Construction Project Office (FPO-1), Chesapeake Division, Naval Facilities Engineering Command, as part of NAVFAC's Specialized Inspection Program. It covers the inspection of Piers 2, 7, and 9. The inspection was specifically oriented to the assessment of the physical condition of the concrete bearing piles of Piers 2 and 7 which are located on the Naval Station and the concrete and wooden bearing piles of Pier 9 located at the Naval Training Center, San Diego. Piers 2 and 7 are relatively new Piers, Pier 2 having been constructed in 1983 and Pier 7 in 1979. Pier 9 was built in 1942.

1.3 POST INSPECTION BRIEFING

Following standard practice in the Underwater Inspection Program, briefings were given to Naval Station command personnel on September 7 and 13, 1984. Giving the debriefings were Mr. Wade Casey, E.I.C. of Chesapeake Division, Naval Facilities Engineering Command and Mr. A. J. Blaylock of Blaylock-Willis and Associates.

The first debriefing was given to the Base Commander, Captain C. Vought, and was attended by Lt. Cmdr. D.G. Roach, Staff Civil Engineer. Later in the morning of September 7, a second debriefing was given to the Staff Civil Engineers' personnel. Attendant at this meeting were Lt. Cmdr. Roach, Mr. Romeo Flores, Facilities Planner, and Mr. John Dye, Facilities Planner.

A third debriefing was given on September 13, 1984 which included the attendees of the second debriefing plus Cmdr. R. J. Gibben, Waterfront Officer, and Mr. Norman Warner, Waterfront Operations Director.

SECTION 2 - ACTIVITY DESCRIPTION

2.1 LOCATION

The Naval Station, San Diego, California is located on the eastern shore of San Diego Bay, about 16.5 miles inboard of the entrance to the Bay (see Fig. 1). The Station comprises 1133.6 acres of land area and 380.0 acres of water area.

The sheltered location within the Bay with a shoreline distance in excess of five miles is well suited to the mission of the activity, and its support of Fleet and shore-based units. It is 9 miles north of the border with Mexico.

2.2 HISTORY

In 1919, the City of San Diego deeded 88 acres of waterfront tidelands to the Navy for construction of a docking and repair facility to support the growing Pacific Fleet. In 1922, the original installation was completed and was commissioned a Naval Destroyer Base. This compound comprised the area and facilities now used by the Development and Training Center, and was first used for the upkeep and maintenance of 34 decommissioned World War I destroyers.

Further growth was slow until the late 1930's and the wartime decade of the 1940's, during which the remainder of the installation was built in a succession of land acquisition and facilities development programs. These include the Naval Supply Center's National City Complex, the Fleet Training Center, and Service School Command, training facilities, waterfront operations, boat shop, graving drydock, Fleet exchange, messhall, and administrative facilities, all of which are still in use.

In 1943, the installation title was changed to U.S. Naval Repair Base, reflecting the activity's growing industrial capacity. More than 5000 ships were converted or overhauled during the wartime period.

The present "South Pier Area" was acquired and developed in the middle and late 1940's, when the end of the war was imminent and piers were needed to mothball a large reserve fleet of decommissioned ships.

The Naval Repair Facility was closed in 1964 and the facilities taken over by the Naval Development and Training Center in 1967. During 1973, the Shore Establishment Realignment program transferred 29 ships from Long Beach to NavSta along with additional consolidations. The Naval Inactive Ship Maintenance Facility was disestablished in 1974, followed by the administrative consolidation of the Cruiser-Destroyer, Amphibious, and Service Forces in 1975, to form the Naval Surface Forces Command, U.S. Pacific Fleet.

Today, the NavSta faces the challenge of accommodating its share of the proposed 600-ship fleet which is to be operational by the end of the decade. The implications here are substantial, embracing the entire spectrum of shore support capacity.

2.3 MISSION

The mission of NavSta is deceptively simple; it is, "To provide, as appropriate, logistics support for the operating forces of the U.S. Navy, and for dependent activities and other commands, as assigned." When placed into perspective, this becomes a highly complex assignment.

2.4 ENVIRONMENTAL DATA[1]

The climatic region of San Diego is classified as dry steppe (BSk) Kopen-Geiger classification system. The climate is characterized by ocean-influenced mild temperatures and light to moderate precipitation, primarily during the winter months.

The average annual rainfall recorded at Lindbergh Field four miles from the Naval Station is 10.4 inches. Heavy fogs occur in San Diego Bay approximately 24 days per year, most frequently in the Fall and Winter months.

Air temperature has an annual mean of approximately 63 degrees F. Coldest temperatures (45 degrees to 60 degrees) generally occur in January, and the warmest (68 degrees to 75 degrees) in August and September. Temperatures within the San Diego Bay immediate area are more moderate than in the surrounding upland areas.

Characteristic of the Bay area is the predominant sea-land breeze which persists as a westerly daytime wind, sometimes with a countering easterly land breeze at night. The average wind velocity at Lindbergh Field is 6.6 knots. Strong winds or gales are infrequent. The maximum wind recorded in San Diego occurred in November of 1944. It was from the southwest and 51 mph — approximately parallel to the subject piers.

The larger San Diego area is subject to adverse meteorlogical conditions that are conducive to the concentration of air pollutants (smog). However, the Bay area experiences fewer air quality impacts due to the prevailing westerly winds and the absence of significant pollutant sources to the west.

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(1) Bibliography

San Diego Bay is crescent-shaped, about 22 miles long, and from 1/4 to 2-3/4 miles wide. It covers 18 square miles and contains 300,000,000 cubic yards of water at mean tide. The Bay tidal prism (the volume of water contained between high and low tide horizontal planes) is about 1/3 of its total volume.

Water depths in the northern section of the Bay generally exceed 30 feet, with about 70 feet maximum. Adjacent to the Naval Station, they are in the range of 10 to 15 feet, except for the main channel and the berthing areas which are 30 feet to 40 feet.

Average tidal range is 5.6 feet and extreme range is 10.0 feet. The maximum tidal currents in the Naval Station vicinity are less than 1 foot per second.

Historically, the floor and Bay margins are characterized by formational materials, sand, silt, clay and mud deposits. Mud deposits characterize eastern and southern margins of the Bay, which includes the Naval Station.

Past dredging activities have removed most of the mud deposits in the Naval Station area so that medium dense, silty sands are encountered a few feet below the existing bottom. The deeper deposits are quite dense and exhibit considerable structural competence.

The State of California is within an active seismic region. San Diego has experienced mild earthquakes in recorded history, but none have been catastrophic.

There are several fault systems in Southern California which must be considered in making a seismic assessment of the Naval

Station for potential earthquake damage. These include the Rose Canyon and La Nacion Faults which are in the vicinity of the Naval Station (five miles and one mile respectively), the Elsinore Fault located 50 miles to the east, the San Jacinto Fault 75 miles distant to the east, and the San Andreas Fault 85 miles to the east. It is understood that the largest probable magnitude earthquake would be generated by the San Andreas Fault (8.3 Richter scale). However, the San Jacinto Fault with a maximum probable magnitude of 7.8 could produce the largest ground acceleration in San Diego due to its closer proximity. That acceleration is estimated to be 20 percent g (gravity).

Most of the Naval Station west of Harbor Drive is reclaimed tidelands produced by dredged fill. These soils are susceptible to liquifaction in the presence of strong seismic energy waves, with resulting damage to existing structures.

Water quality in San Diego Bay is presently acceptable for most human activities, including water recreational purposes. In recent history, it has not always been this good. The first collection plant for area sewage was constructed by the City in 1887 to collect the random disharges that were polluting the Bay. The pollution had been so concentrated that the Navy had expressed concern that the Bay waters were affecting the paint on naval vessels. However, untreated and partially treated sewage continued to be discharged into the Bay by the surrounding communities until 1963.

In June 1943, the San Diego Municipal Sewage Treatment Plant was opened. It was a 14 million gpd facility located immediately east of the Naval Station. The effluent discharge lines — a 24 inch and a 42 inch — were located parallel to and 90 feet north of Pier 5. These lines remain in place to this day. The discharge risers are in line with the end of Pier 5. By 1948, the plant had been enlarged to a 40 million gpd capacity.

Throughout the history of this plant, it was overloaded. The prognoses of sewage volume were short of anticipating the actual volumes of sewage produced by the rapidly growing San Diego area. As a result, the plant was unable to function as planned and much of the time heavily chlorinated, partially treated sewage was discharged into the Bay. The surrounding areas of Southern San Diego were suffused with the heavy odor of hydrogen sulphide.

In the Bay....."the disolved oxygen concentration was less than 4mg/per l — an accepted minimum for marine life is 5 mg/per l.....Coloriform counts were in excess of 10 per mililitre — past the danger point for life sustenance; turbidity was such that visibility was less than 4 feet; plankton blooms proliferated and sludge deposits stifled bottom marine life."(2)

Sewage discharged from the cities surrounding the Bay ceased as of 1963. At that time, industrial and municipal sewage discharges were required to flow into the San Diego Metropolitan Sewerage System. This system discharges its effluent into the ocean west of Point Loma.

The concentration of sulphate ion in open ocean water is high enough to create an environment hostile to Portland cement concrete. (See Section 5.2.1) Quite obviously, the first twenty years of service life of the subject piers and quaywall witnessed the concentration of sulphate ion in the surrounding Bay waters. It was very high, to say the least. And the exposure of the concrete piles to sulphate attack was much greater than would be expected in the cleaner waters of the Bay entrance, or in the open sea. With this in mind, the writer is pleasantly surprised to find the pier piling exhibiting as little sulphate deterioration as they are.

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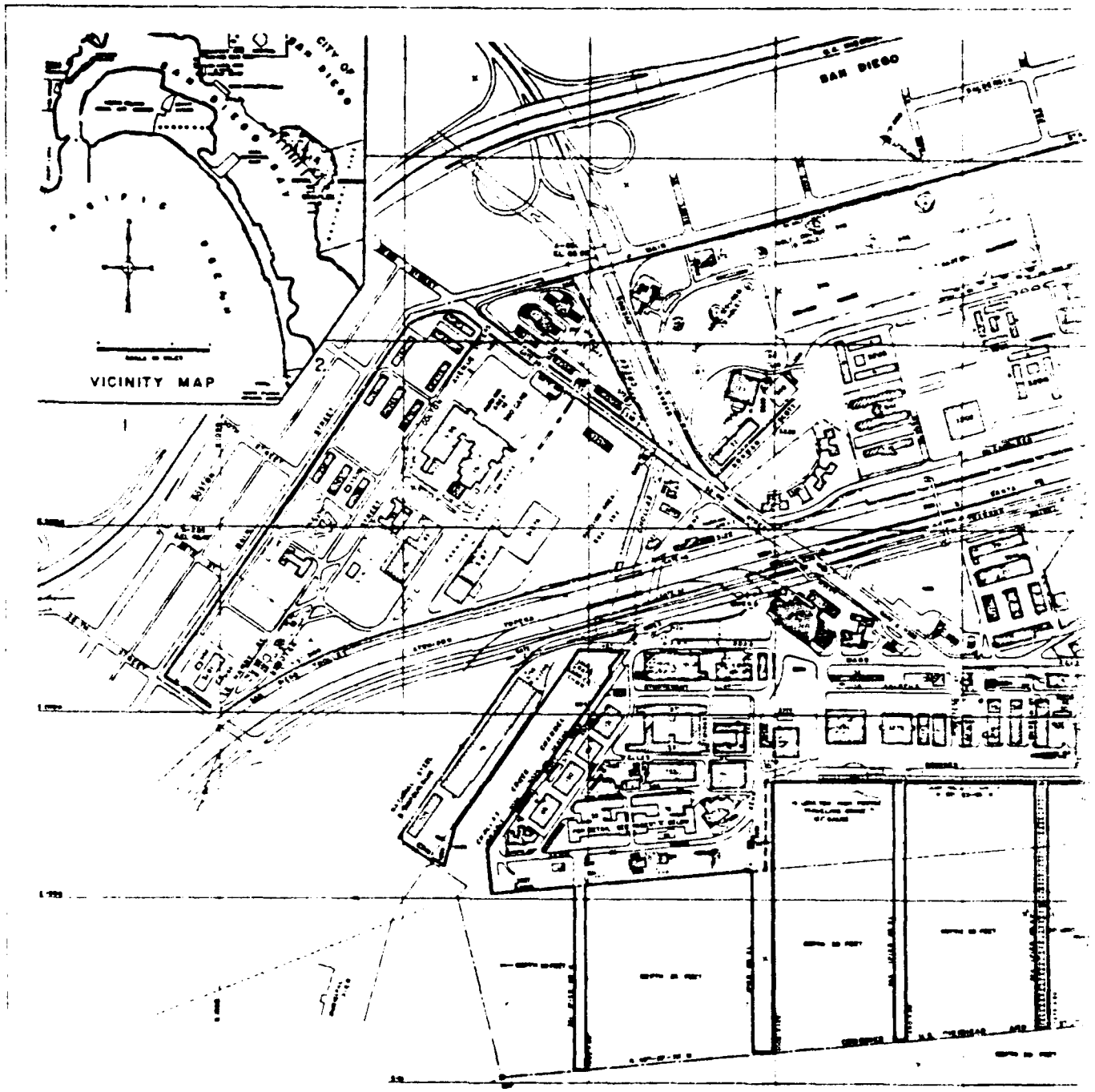
(2) Bibliography, Page 88

Marine vegetation exists within San Diego Bay in the forms of various species of algae and one species of sea grass. The sea grass grows in the calm water near shore areas adjacent to the Naval Station. Marine algae are represented by large filamentous forms of red and green algae such as witche's hair or mermaid's hair. In addition, forms of green algae such as sea lettuce are found attached to rocks and marine structures. Over 200 species of marine invertebrates have been found. Sediment samples reveal infaunal organisms, including many species of polychaetes, small crustaceans and various bivalves.

Marine invertebrates found on pier piling, rocks, and marine floats include lobsters, crabs, worms, mussels, barnacles, echinoderms, sponges, sea anemones, and tunicates. Eighty to ninety different fish species live in the Bay.


VICINITY MAP
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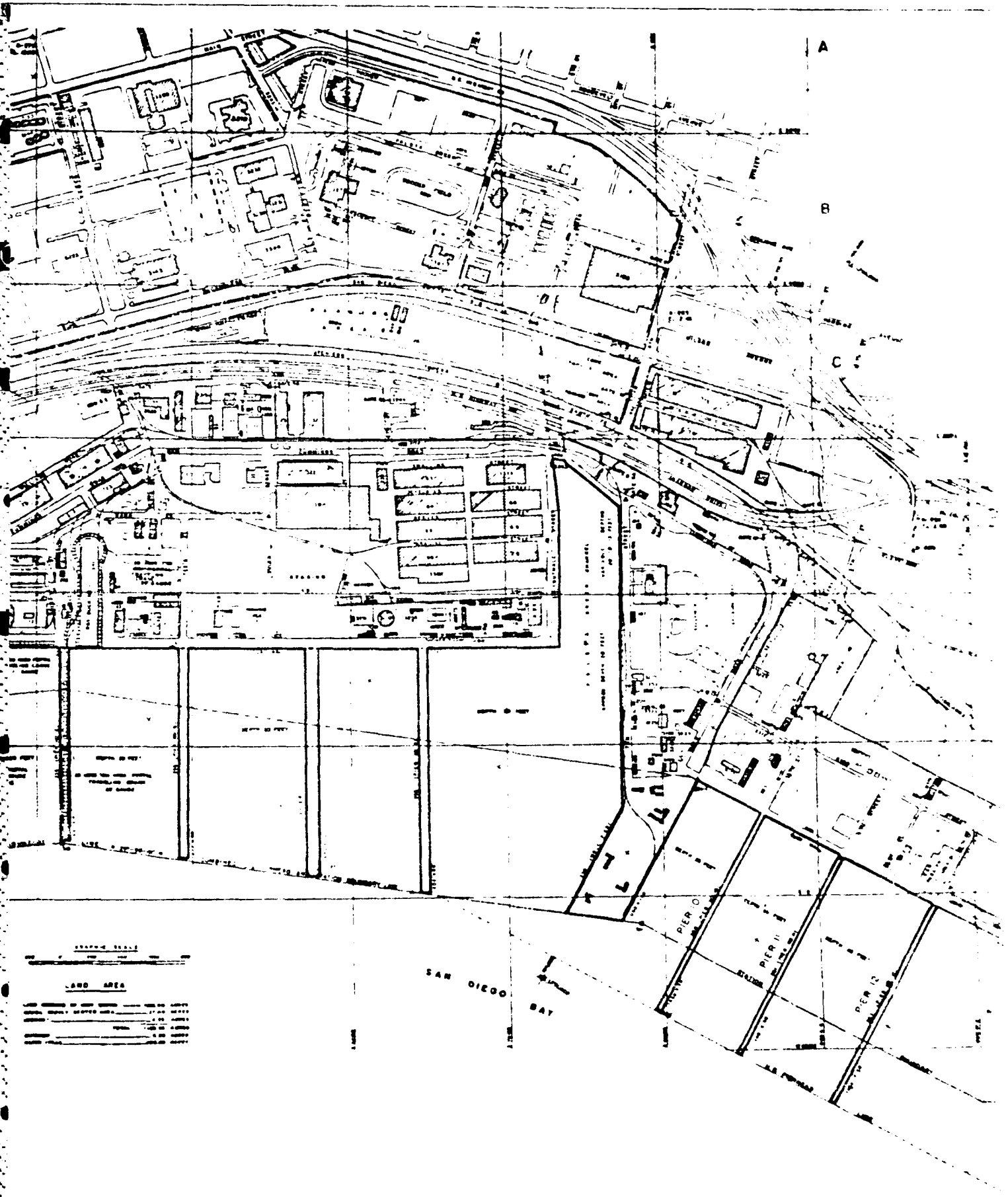
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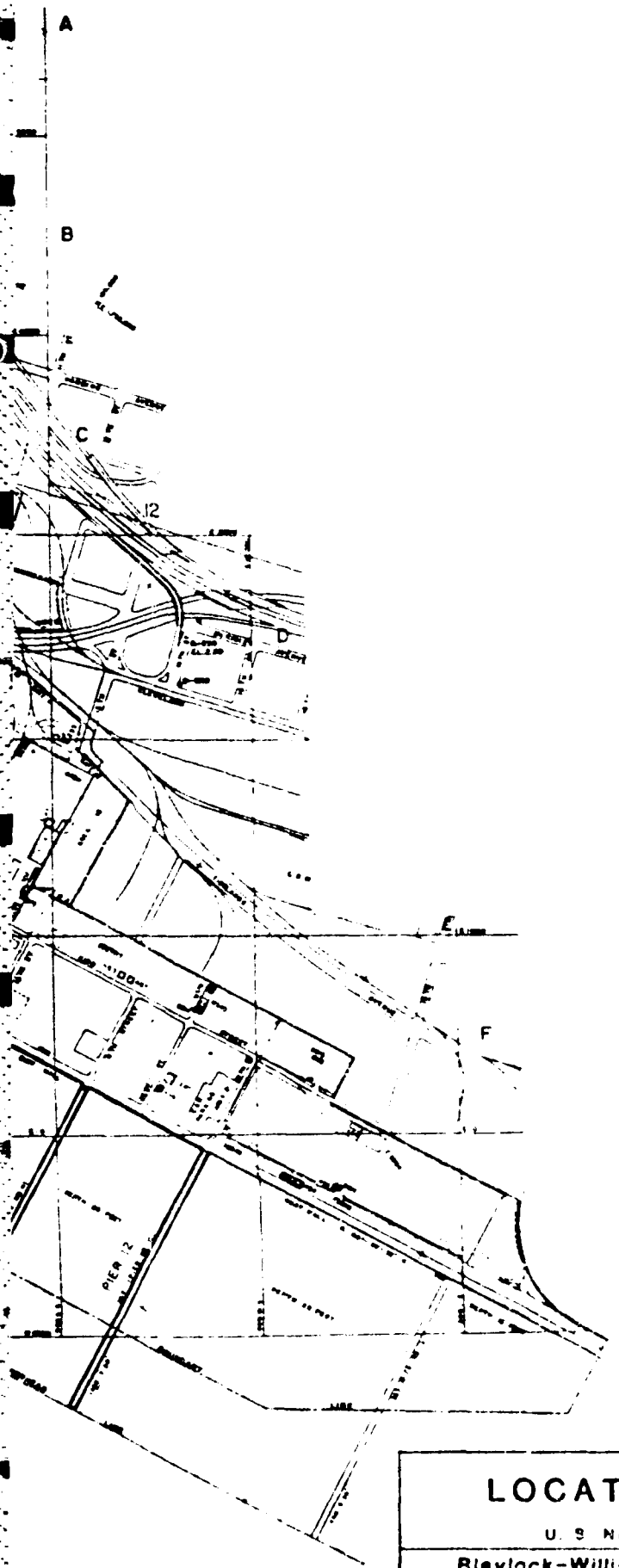

LOCATION AND VICINITY MAP

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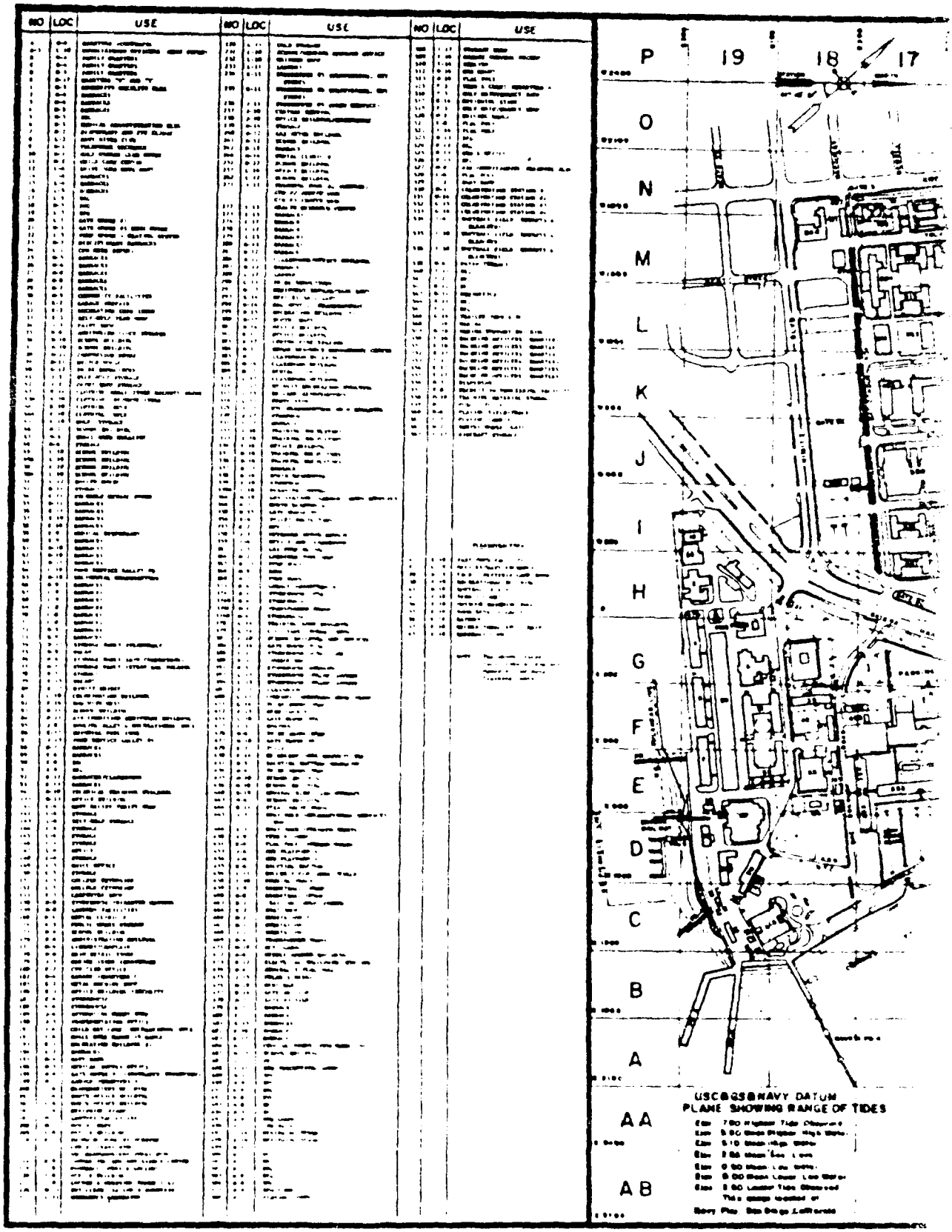
Blaylock-Willis and Associates STRUCTURAL ENGINEERS SAN DIEGO CALIFORNIA	DATE DEC 1984	FIG. 1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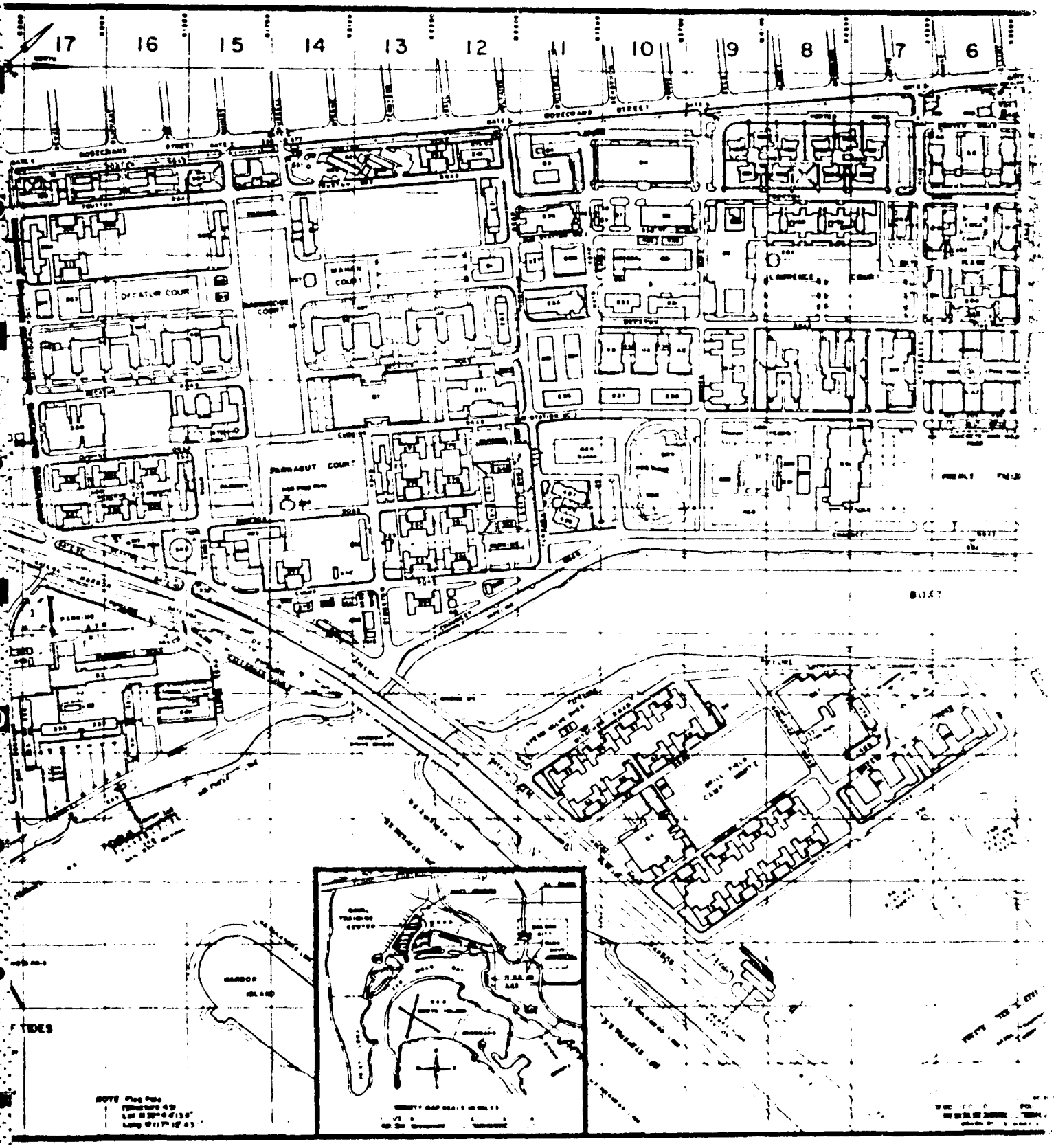
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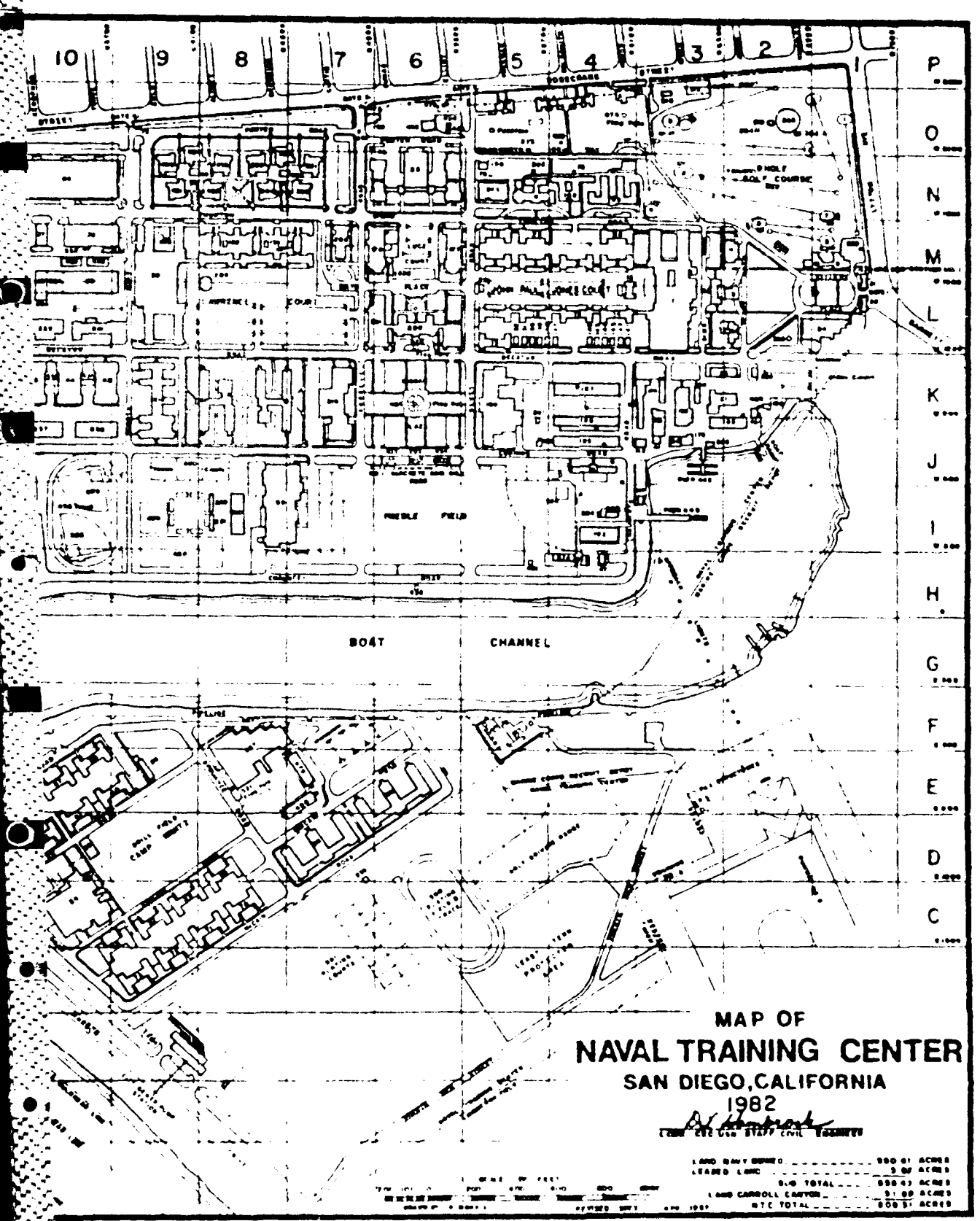
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MAP OF
NAVAL TRAINING CENTER
SAN DIEGO, CALIFORNIA
1982

FIG. 2

SECTION 3 - INSPECTION PROCEDURE

3.1 LEVEL OF INSPECTION

The on-site underwater inspection phase of the work was performed by a team composed of three engineers at any one time in the period between August 21 and September 11, 1984.

Photographs were taken by a commercial underwater photographer supported by the engineering team on September 11, 1984.

The inspection techniques were dictated by the requirements of the Scope of Work and the need for that quality of inspection that would yield the proper information to support accurate assessment and recommendations for the structure inspected.

3.2 INSPECTION PROCEDURE

The work was conducted using three engineers at any one time with two diving and the third acting as tender. The divers were in the same vicinity at all times so that the single tender did not represent a violation of safe diving standards. Communication between diver and tender was by voice.

A Level I examination was performed on all perimeter piles of Piers 2 and 7. In addition, a modified Level I examination was performed on all remaining interior piles of Pier 7. This latter was a swim-by of the piles at an elevation of two to four feet below MLW to detect any obvious damage.

Pier 9 is supported by both concrete and wood piles. All wood piles were subjected to an extended Level I examination where the entire surface of each pile is inspected for evidence of borer intrusion or other physical damage. The borer intrusion often is very subtle and localized so that the closer inspection is needed. The soundness of

the wood piling was recorded according to the following scale:

1. Very good: Damage less than 1/4". Estimated service life in San Diego Harbor 8 years.

2. Good: Damage 1/4" to 1". Estimated service life in San Diego Harbor 6 years.

3. Fair: Damage 1" to 2 1/2". Estimated service life in San Diego Harbor 4 years.

4. Poor: Damage 2 1/2" to 4". Estimated life 1 1/2 years.

5. Bad: Damage greater than 4". No service life.

In addition, five wood piles were given a Level II examination which involved cleaning of a 10 inch high band at three locations on the pile; MLW, mudline and halfway between these locations.

The concrete piles of Pier 9 were given typical Level I examination and twelve piles given the additional Level II attention. Three sides of the piles were cleaned in a 10 inch high band at the three elevations described for wood piles. The corners of the concrete piles at the cleaned bands were then struck with a pointed hammer to gauge the soundness of the concrete. The soundness was then recorded according to the following nomenclature:

1. Hard: Pick rebounds without making a significant indentation, usually accompanied by a ringing sound clearly heard in the water.

2. Firm: Pick rebounds with a small indentation.

3. Soft: With six blows, 1/4 inch to 1/2 inch indentation can be made.

4. Very Soft: Six blows removes corner of the pile or in excess of 1/2 inch of material.

Record of structural assessment of the concrete sheet piles is shown in Section 5.2.

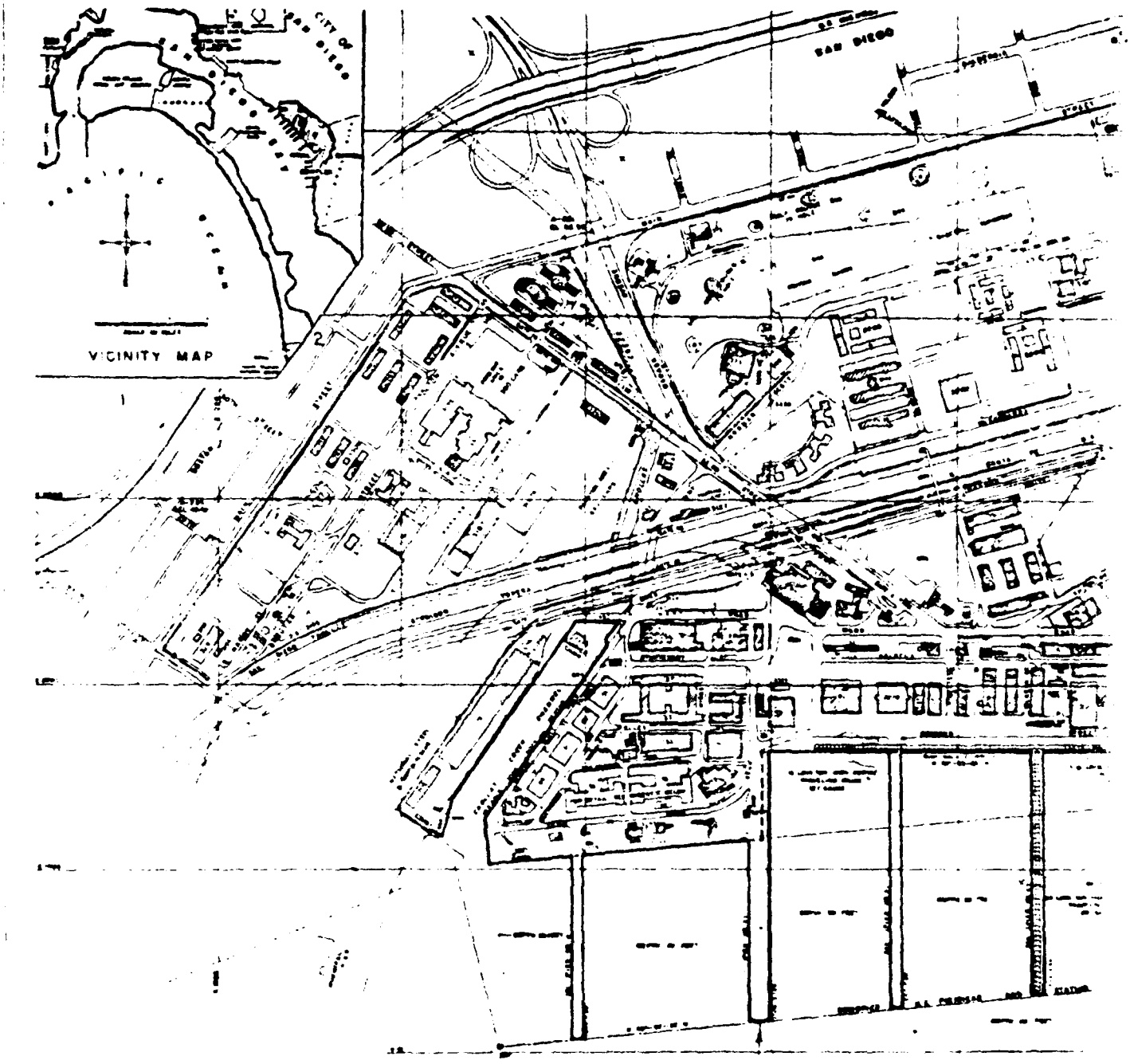
Chipping was attempted at all four exposed corners at each elevation of all bearing piles and the soundness was recorded.

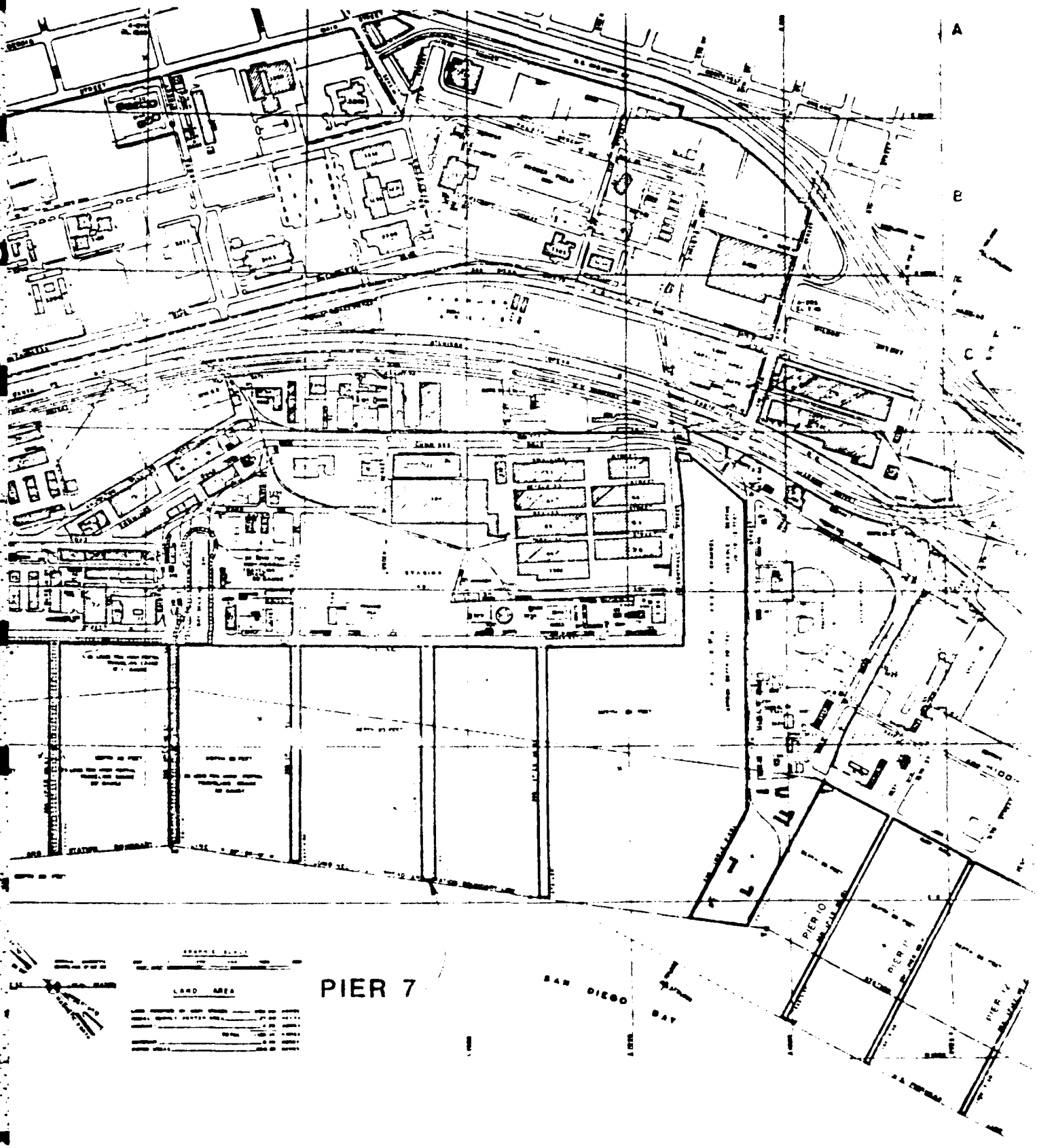
Each concrete pier pile was inspected at its upper connection to the cap beam for evidence of driving fracture or other damage.

It should be noted that non-destructive methods of inspection were used in this project. The conditions noted reflect direct observation coupled with an intimate knowledge of the facilities gained from 25 years of experience with the waterfront structures at the Naval Station.

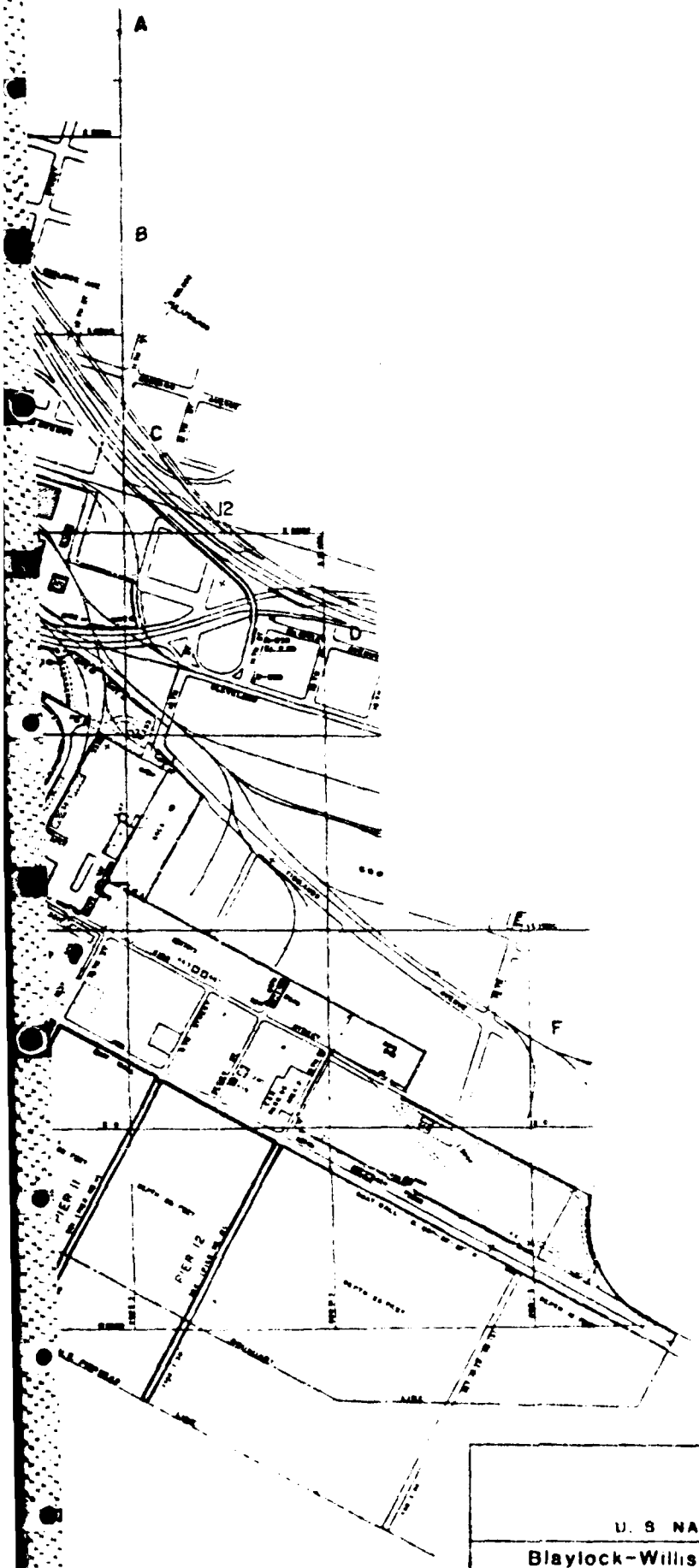
3.3 INSPECTION EQUIPMENT

Equipment used included the usual divers' equipment with scuba gear. Photography equipment included a Nikonos III camera with 15mm wide angle lens and two SR 2000 strobe lights. Chipping hammers and bar scrapers were used to clean and test the piles.


VICINITY MAP
SAN DIEGO
PIER 2



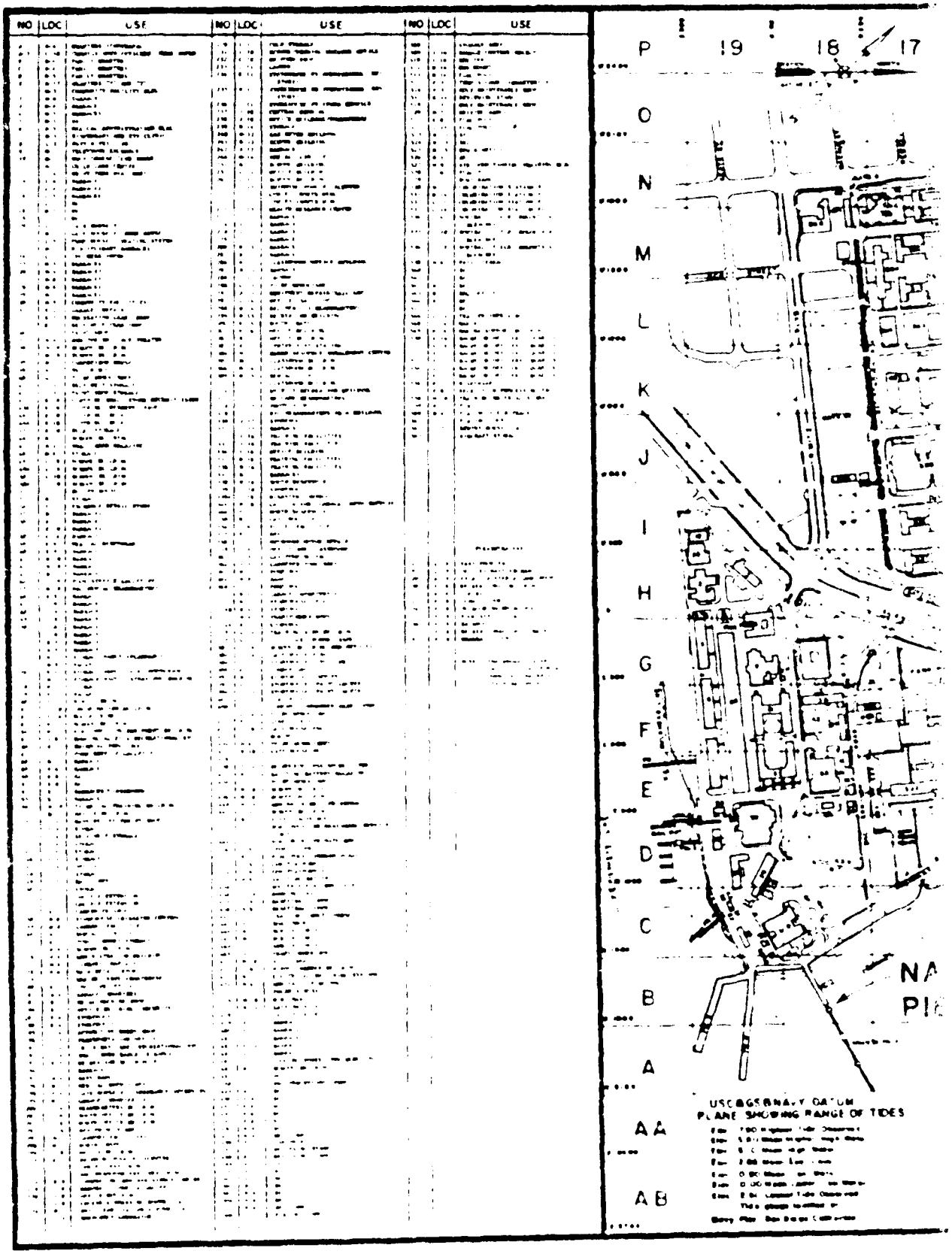
PIER 7



KEY PLAN

U. S NAVAL STATION, SAN DIEGO, CALIFORNIA

Blaylock-Willis and Associates STRUCTURAL ENGINEERS SAN DIEGO, CALIFORNIA	DATE DEC 1984	FIG. 3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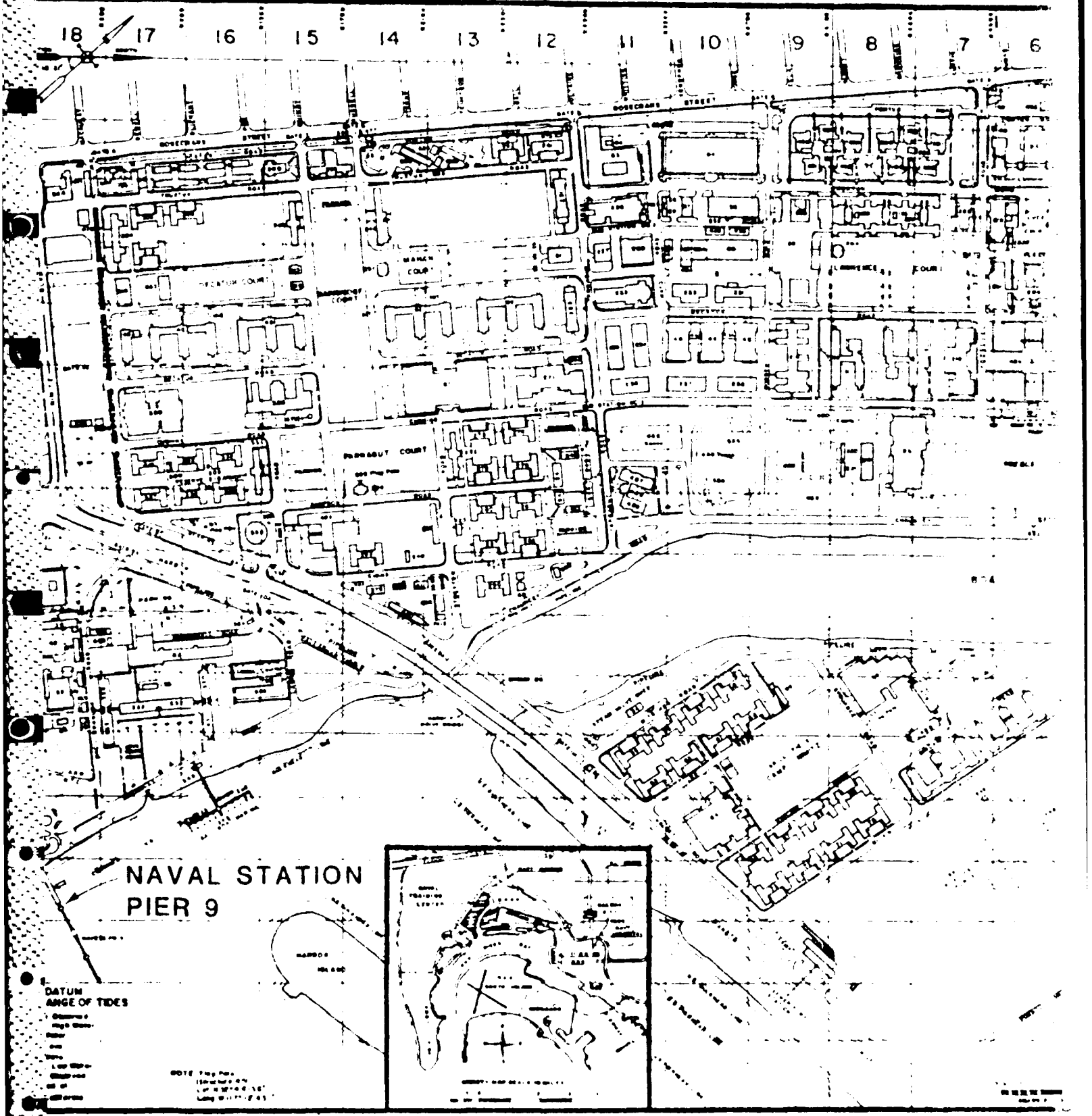
A
AA
AB
19
18
17
NA
PI
USC&GS/NAVY DATUM
PLANE SHOWING RANGE OF TIDES


18
17
16
15
14
13
12
11
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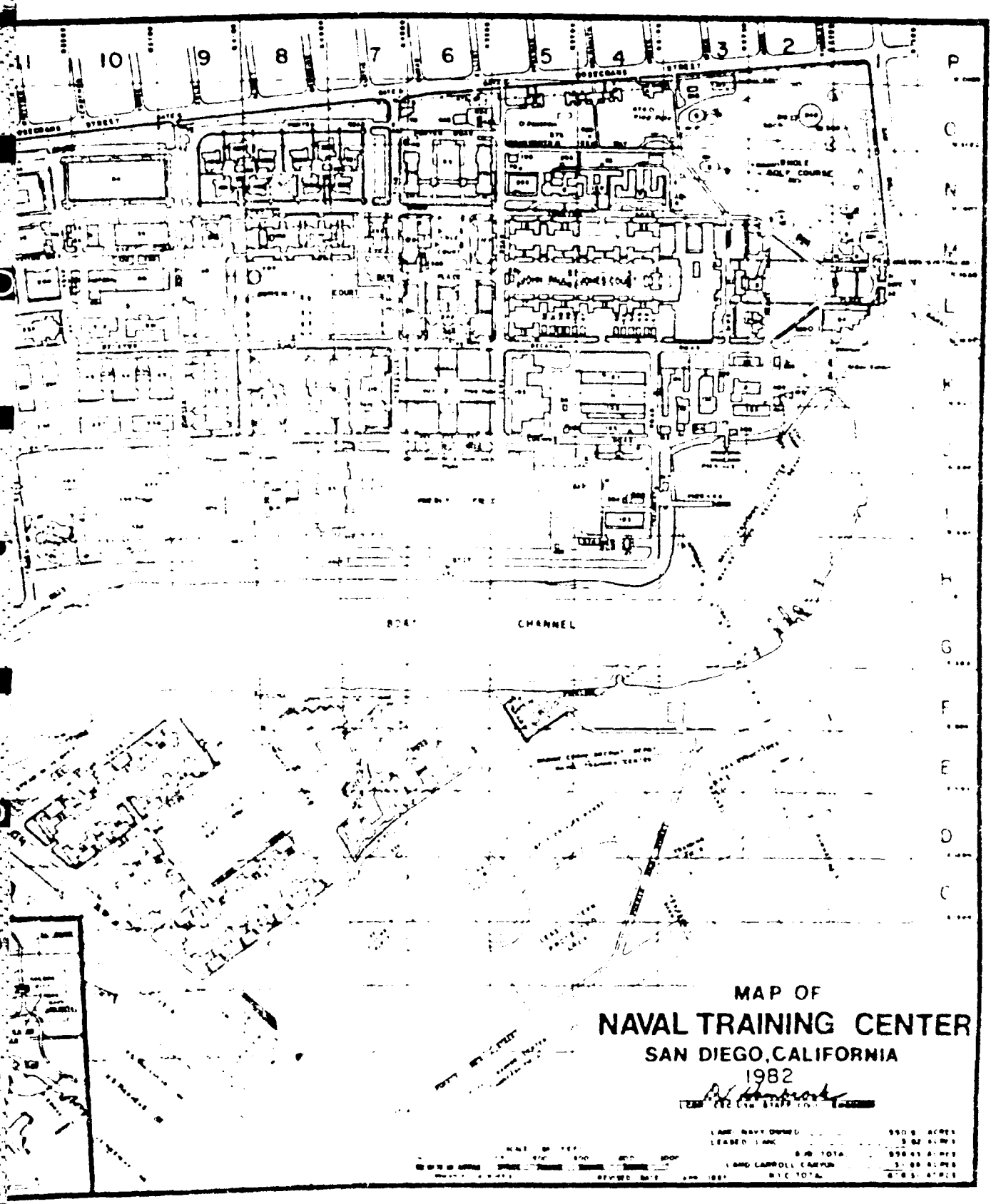
9
8
7
6
NAVAL STATION
PIER 9
DATUM
RANGE OF TIDES


11
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4
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2
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E
D
C
CHANNEL
MAP OF
NAVAL TRAINING CENTER
SAN DIEGO, CALIFORNIA
1982

FIG. 4

SECTION 4 - FACILITIES INSPECTED

4.1 PIER 2

4.1.1 DESCRIPTION OF THE FACILITY

Pier 2 is located in the northern part of the Naval Station, the second pier south of Chollas Creek at the dogleg offset of the Quay Wall. It was constructed under construction contract N62474-77-C-2565, from drawings dated March 22, 1979. It is an enlargement of and replacement for a Pier 2 constructed in 1942 at this site.

The Pier is 1474'-8" in total length. The outer 1002'-8" is 117'-0" in width. The inner 472'-0" parallels the Quay Wall dogleg, and is 46'-0" in width and has the appearance of a marginal wharf. The Pier is supported on 20 inch square prestressed concrete piles.

Pier 2 has not been the subject of an underwater inspection prior to this time.

4.1.2 OBSERVED CONDITIONS

The Pier is in excellent condition. Except for two widely separated piles, the piling, pile caps and deck surfaces show no evidence of damage.

Pile 13-A has hairline cracks on its north and south face, a single crack each face about three inches from a corner. The cracks extend from about ten feet above the mudline fifteen feet upward where they disappear. This observer has never seen a similar crack in a prestressed concrete pile. There is no evidence of rust bleeding.

Pile 33-A has a horizontal crack on its south face about three feet below the cap beam. This crack is bleeding slightly.

There is no evidence of sulphate damage to the concrete piles.

4.1.3 STRUCTURAL CONDITION ASSESSMENT

Pier 2 was designed to the following structural criteria:

I. Loads

A. Gravity

1. Main Deck

a. 600 psf uniformly distributed Live Load or:

b. HS20 Truck Loading or:

c. Unlimited operation of 90 ton truck crane, except maximum lift shall not exceed 36 tons, and the maximum outrigger load shall not exceed 80.5 tons.

2. Pipe Runway Cover

a. 100 psf Live Load or:

b. 200 # concentrated Load on a 2 1/2 foot square area.

B. Lateral

1. Wind Load: Based on wind velocity of 50 MPH

2. Seismic Load:

V = ZKCW, Z = 1.5, K = 1.33, C = 0.06

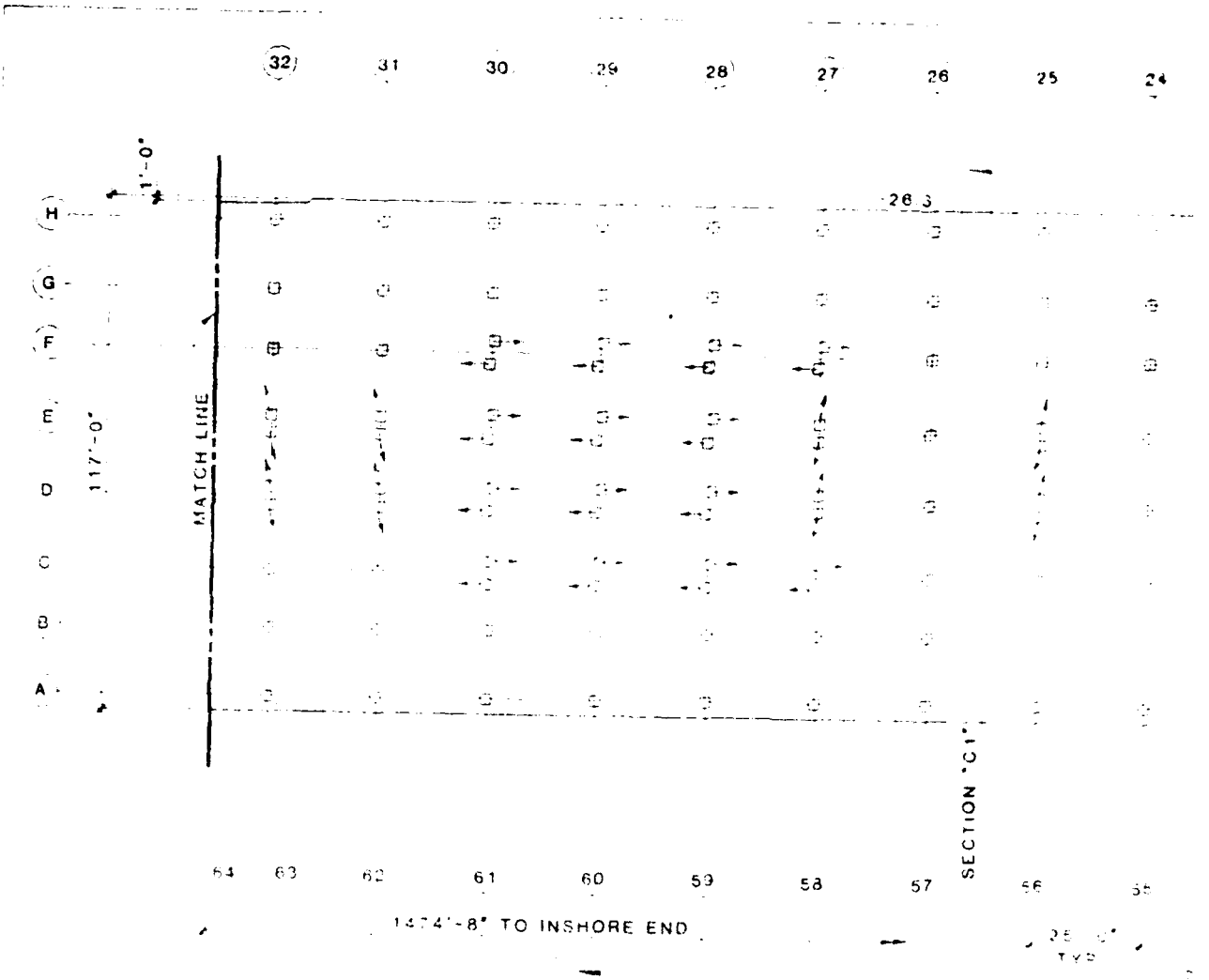
W = DL+75 psf L.L.

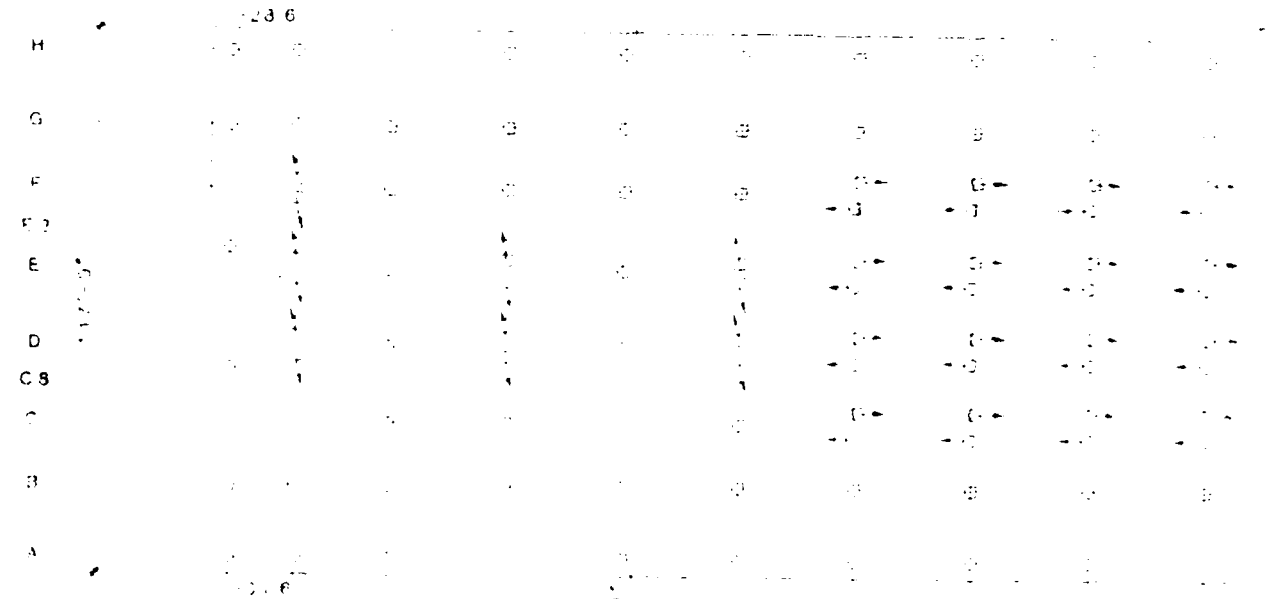
II. Concrete		f'c psi	f'ci psi
A.	Prestressed Concrete Piles	6000	3000
B.	All C.I.P. Concrete	4000	----
C.	Precast, Prestressed Slabs	5000	4000
D.	Precast Covers, Vaults	4000	----
E.	Grout	4000	----
F.	Utility Vaults	4000	----

As described above, the Pier appears in excellent condition. The cracks in Piles 13A and 33-A are not considered to significantly reduce the load capacity of the pile.

4.1.4 RECOMMENDATIONS

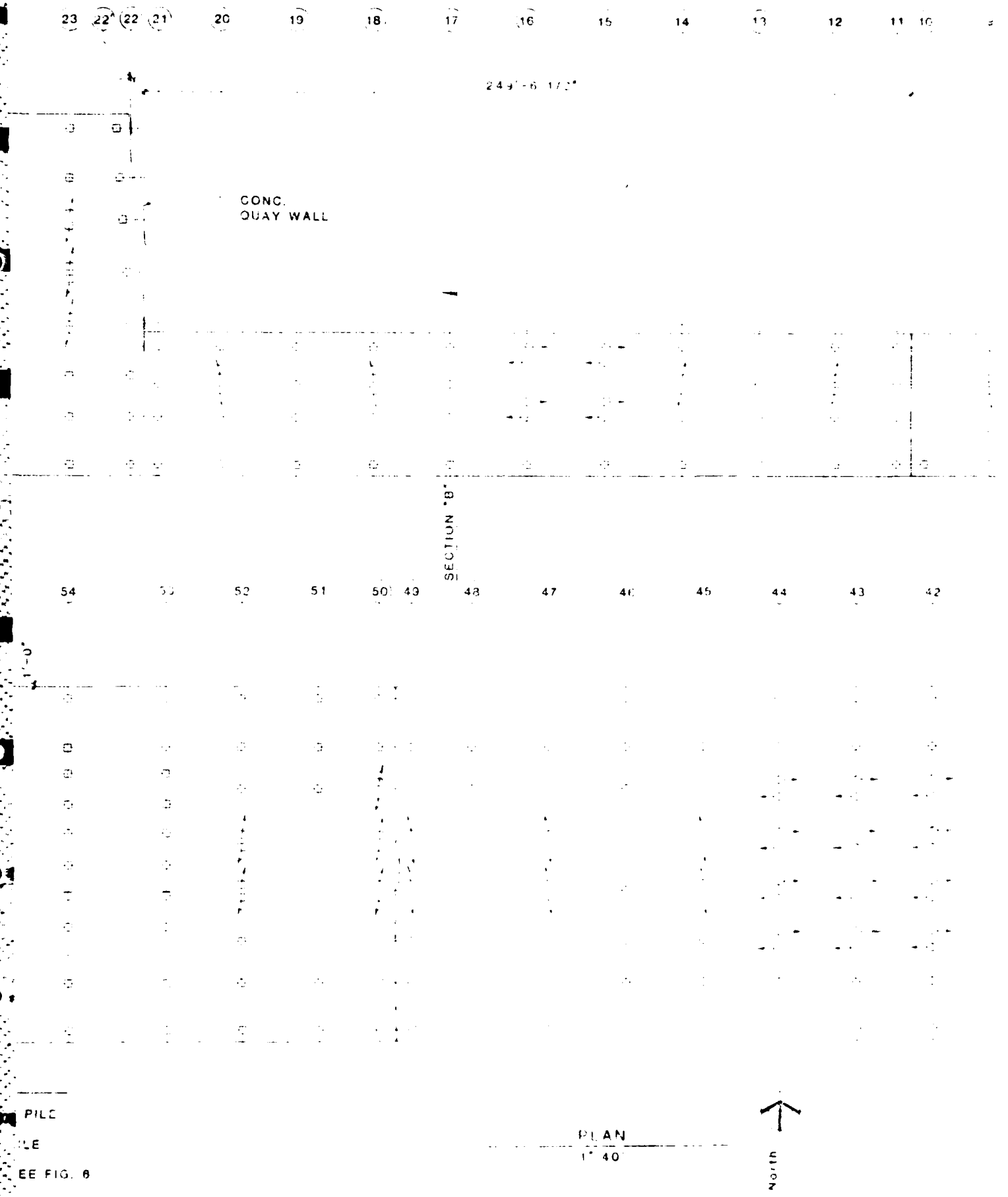
The next inspection should direct specific attention to Piles 13-A and 33-A. It is recommended the Pier be inspected in six years.

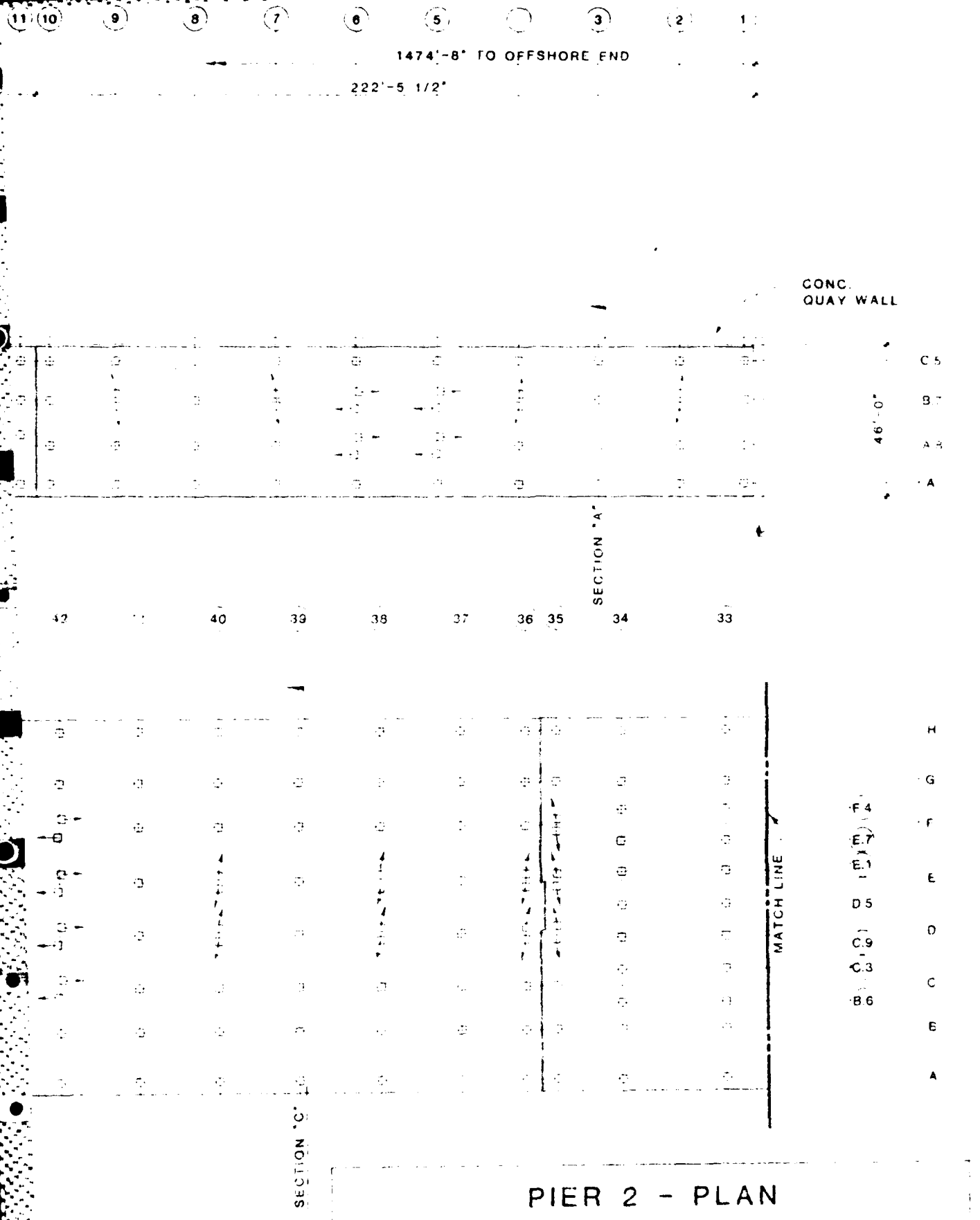




NOTES

1. [illegible] INDICATES 20" SQ. CONC. VERTICAL P
2. [illegible] INDICATES 20" SQ. CONC. BATTER PI
3. FOR SECTIONS CUT ON THIS PLAN SE
4. -31.6 INDICATES MUD LINE ELEVATION MEAN LOWER LOW WATER DATUM - E.

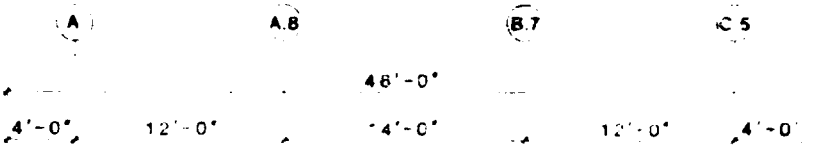

23 22 22 21 20 19 18 17 16 15 14 13 12 11 10
CONC.
QUAY WALL
SECTION "B"
54 52 51 50 49 48 47 46 45 44 43 42
PILE
LE
EE FIG. 6
EL. 0+00
PLAN
1" 40
North



PIER 2 - PLAN

U. S. NAVAL STATION, SAN DIEGO, CALIFORNIA

Blaylock-Willis and Associates STRUCTURAL ENGINEERS SAN DIEGO, CALIFORNIA	DATE DEC. 1984	FIG. 5



8" PRESTRESSED
CONC. PANELS

EL. +12.50

EL. +8.83

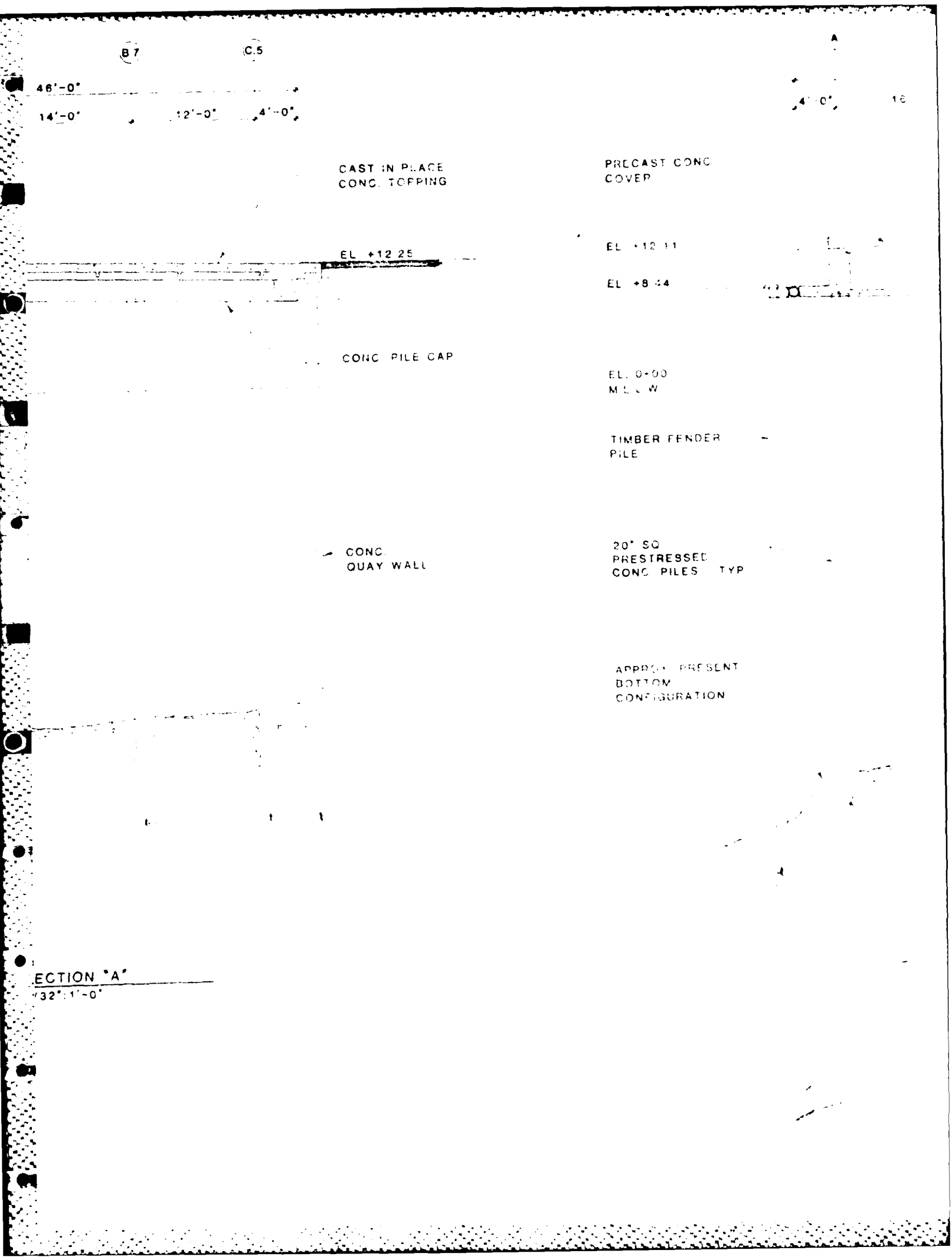
EL. 0.00
M.L.L.W.

TIMBER FENDER
PILE

20" SQ. PRESTRESSED
CONC. PILES - TYP.

APPROX. PRESENT
BOTTOM
CONFIGURATION

SECTION "A"
3/32" = 1'-0"



ECTION "A"
/32": 1'-0"

B B.7 C.5 A

46'-0"

10'-0" 12'-0" 4'-0" 4'-0"

CAST IN PLACE
CONC TOPPING

PRECAST CONC
COVER

EL +11.9

EL +14.2

EL +10.56

9" PRESTRESSED
CONC PANEL

EL 0+00
M.L.L.W

CONC PILE CAP

TIMBER FENDER
PILE

CONC
QUAY WALL

20" SQ.
PRESTRESSED
CONC. PILES - TYP

APPROX PRESENT
BOTTOM
CONFIGURATION

CTION "B"
32":1'-0"

PILE NOTES

CONCRETE
f'c 5000 psi MIN

PRESTRESSING STRANDS
1/2" DIA MAXIMUM

RESIDUAL FINAL PRESTRESS
VERTICAL PILES 744 psi
BATTER PILES 990 psi

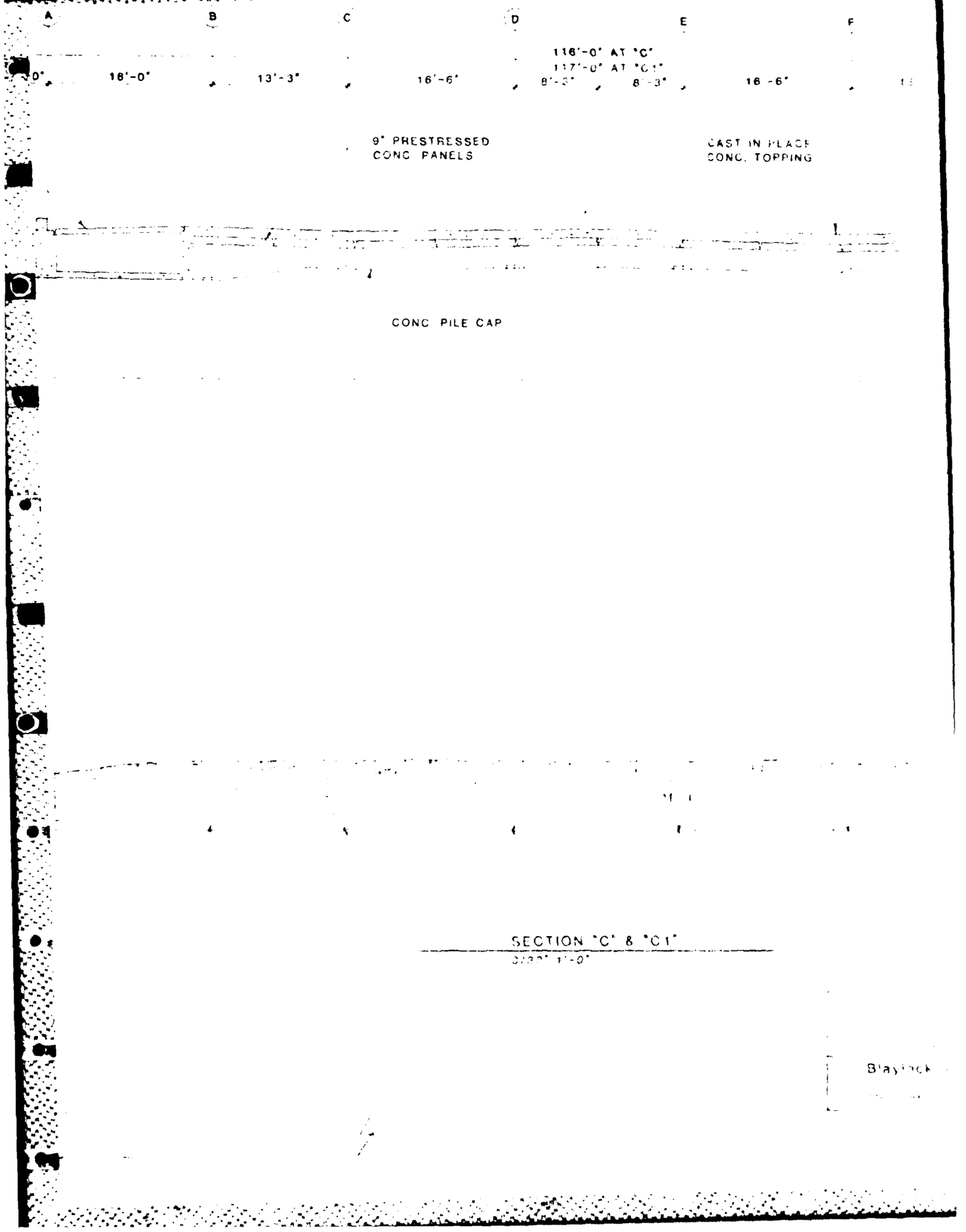
MINIMUM TIP ELEVATIONS
VERTICAL PILES -55.0
BATTER PILES -76.0
M.L.L.W DATUM - EL 0+00

1'-8"
SQ

#5 GA WIRE
SPIRALS

PRESTRESSING
STRANDS

TYPICAL PILE SECTION
3/4":1'-0"



SECTION "C" & "C1"

3/32" 1'-0"

Blaylock

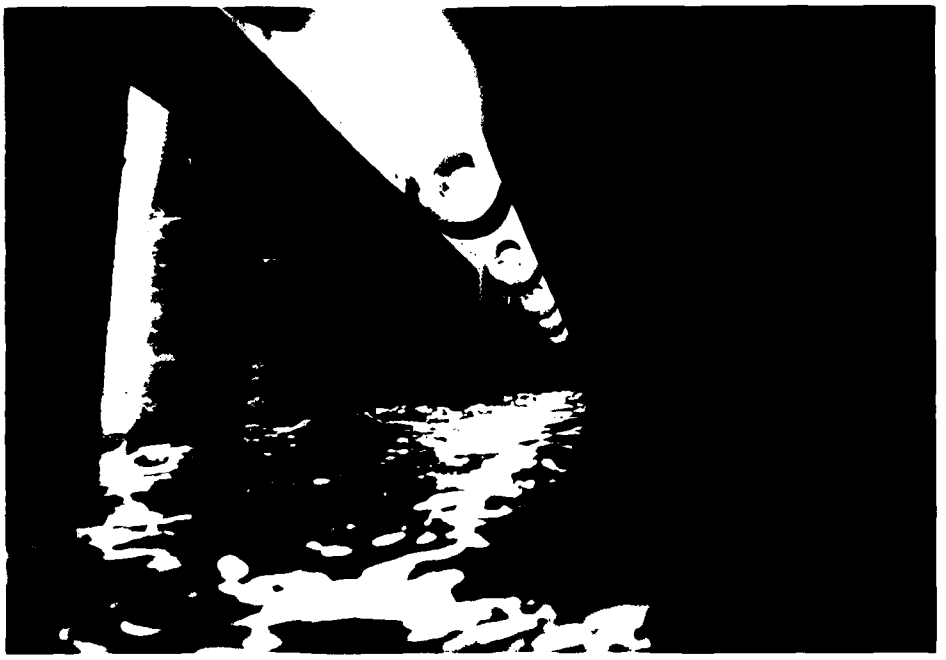
PIER 2
TYPICAL PIER SECTIONS
U. S. NAVAL STATION, SAN DIEGO, CALIFORNIA

Blaylock-Willis and Associates — DATE

STRUCTURAL ENGINEERS — SAN FRANCISCO, CALIFORNIA — DEC 1984

FIG. 6

1. Pier 2 at Naval Station, San Diego, California. Picture is taken to the south.



2. Pier 2. Picture is taken to the west along the southern edge of the Pier.

4.2 PIER 7

4.2.1 DESCRIPTION OF THE FACILITY

Pier 7 is located about midway between the north and south boundaries of the Naval Station.

It was constructed under construction contract N62474-73-C-5719, from drawings dated July 25, 1974.

The Pier is 1480'-0" in total length and 85'-0" wide. It is supported on five longitudinal rows of piles. The interior three rows are 18" octagonal piles. The outer row on each side are 16" octagonal piles.

4.2.2 OBSERVED CONDITIONS

Pier 7 in general is in very good condition. However, the Pier has experienced some damage of a very serious nature.

In Line E, the northern exterior row of piles, nine broken piles were observed at eight locations. In Line A, the southern exterior row of piles, two broken piles were observed. There is also a succession of large spall areas on the underside of the south utility trench in the vicinity of coordinates 1 to 3 which appear to be candidates for gunite repair.

All of the broken piles appear to have been broken in the same manner - by a load applied at the water line from outboard of the pier. Coupled with the extensive damage to the adjacent fender piling, it is obvious that the damage is the result of berthing or docking forces.

Specifically, the broken piles are as follows (see also pictures this section):

Pile 24-E - The upper 8 feet of the pile is missing. A spall at the underside of the utility tunnel where pile was located reveals the horizontal reinforcement of the edge beam and the vertical dowel bars of the missing pile. These latter bars have been burned off with a torch.

Pile 24.5-E - The damaged pile remains in place revealing one break at the underside of utility tunnel and another near the water line. The upper break has lost about a vertical foot of concrete exposing prestress steel sheathing, spiral reinforcement and vertical dowels. Prestress steel and spiral reinforcement are visible at the water line break.

Pile 25-E and 26-E - Piles 25-E and 26-E were located each side of a pier expansion joint. A replacement structure comprising an approximately 3 ft. by 3 ft. by 22 ft. pile cap now spans the expansion joint with 2 new piles below it. The seaward half of the pile cap is separated from the underside of the utility trench with asphaltic impregnated building paper which allows some movement at the expansion joint. The original piles are gone. Spalls and burned stubs of original reinforcing reveal the old locations. The new piles and their new caps are located inboard of Line E with the piles more widely separated than the old piles.

Pile 26.5-E - The upper 8 feet of the pile is missing. A spall at the underside of the utility tunnel shows the horizontal reinforcement of the edge beam and the vertical dowel bars of the missing pile. The dowels appear to have been broken off.

Pile 27-E - Pile 27-E is badly broken. It has a replacement pile which is also broken. It is the writers understanding that 27-E was originally broken and a replacement driven very close behind it. At a later date, 27-E was again struck at the water line and deflected inboard so as to break the replacement pile. Pile 27-E

has several feet of concrete missing at its upper connection showing mild steel reinforcement prestress sheathing and spiral reinforcement. The concrete remaining inside the spiral is popcorn.

Pile 27.5-E - As with some of the other piles, the upper 8 feet of this pile is missing. A spall at the underside of the utility trench shows the broken off stubs of pile dowel bars.

Pile 28-E - This pile is broken at the top and water line with a dogleg deflection of about 16 inches at the lower break.

Pile 28.5-A - This pile is broken typically at the top and water line with the top also severely displaced inboard. Upper concrete is missing revealing the reinforcement and popcorn inside the spiral reinforcing steel. A very large spall has occurred at the underside of the utility tunnel at the pile.

Pile 29-A - The pile is broken typically with breaks at top and water line. However, it has not been displaced as far as the others. The spall in the utility tunnel above the pile is surprisingly large to this observer.

The spalls in the underside of the utility tunnel along Line A near coordinates 1 to 3 have the appearance of reinforcing steel spalls. The steel has been placed with inadequate cover below the bars (the plans indicate 3 inches miniumum). The bars have rusted, swelled and spalled off the concrete surface.

4.2.3 STRUCTURAL CONDITION ASSESSMENT

Except for the broken piles and the spall areas described above, the Pier is in very good condition.

However, the missing support, represented by the broken piles, creates a very serious structural problem. The Pier in

supporting the deck line and dead loads is performing differently than its principal structure indicates it should. It is fortunate that the designers of the Pier provided this redundancy.

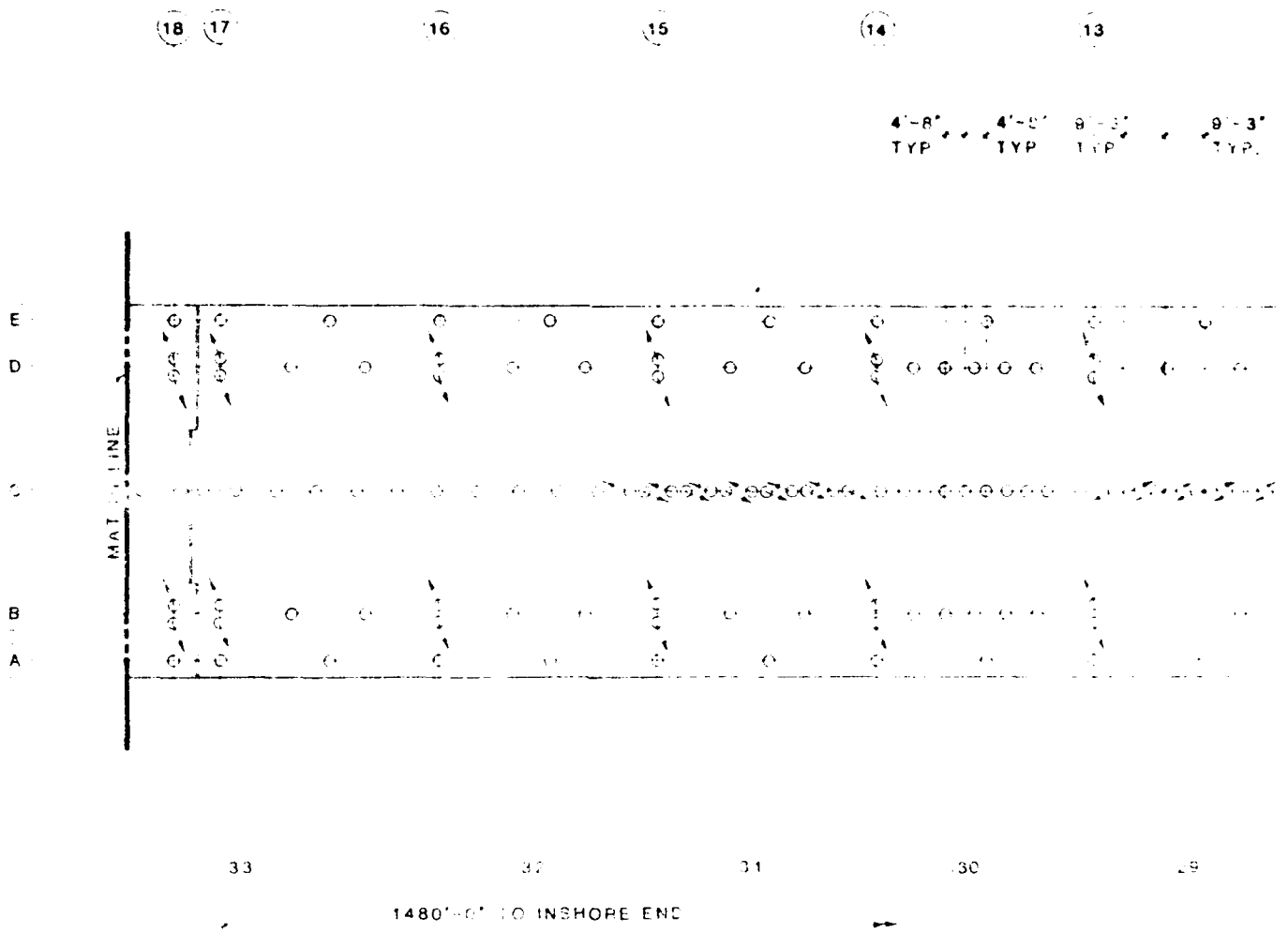
However, without the vertical load carrying capacity of the damaged piles, the Piers ability to sustain loads is dangerously compromised.

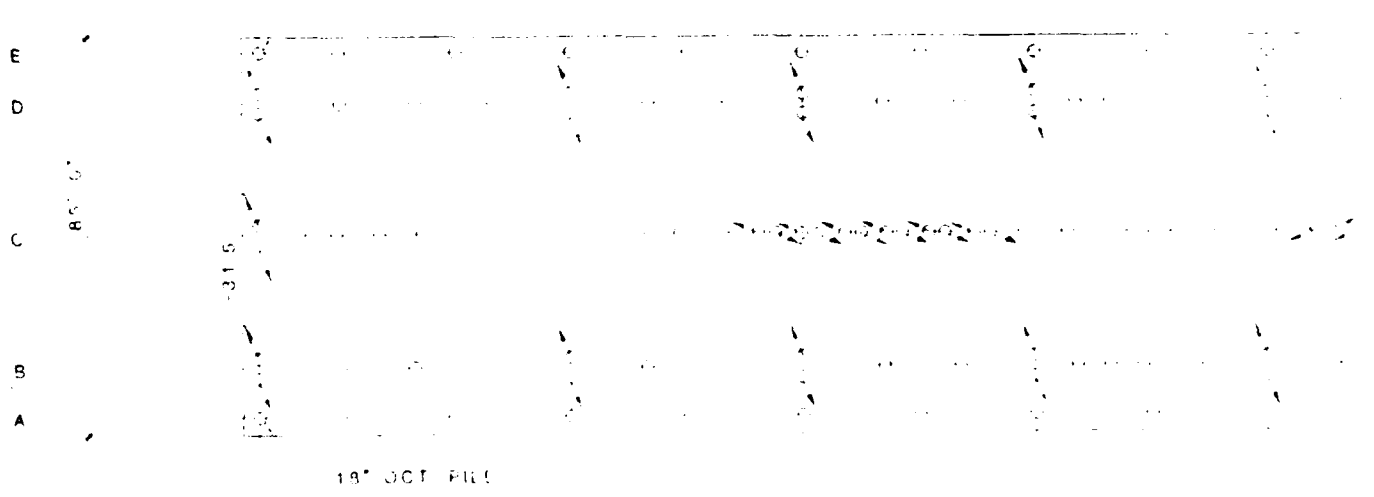
The spalled concrete does not represent an immediate threat to the structural integrity of the pier.

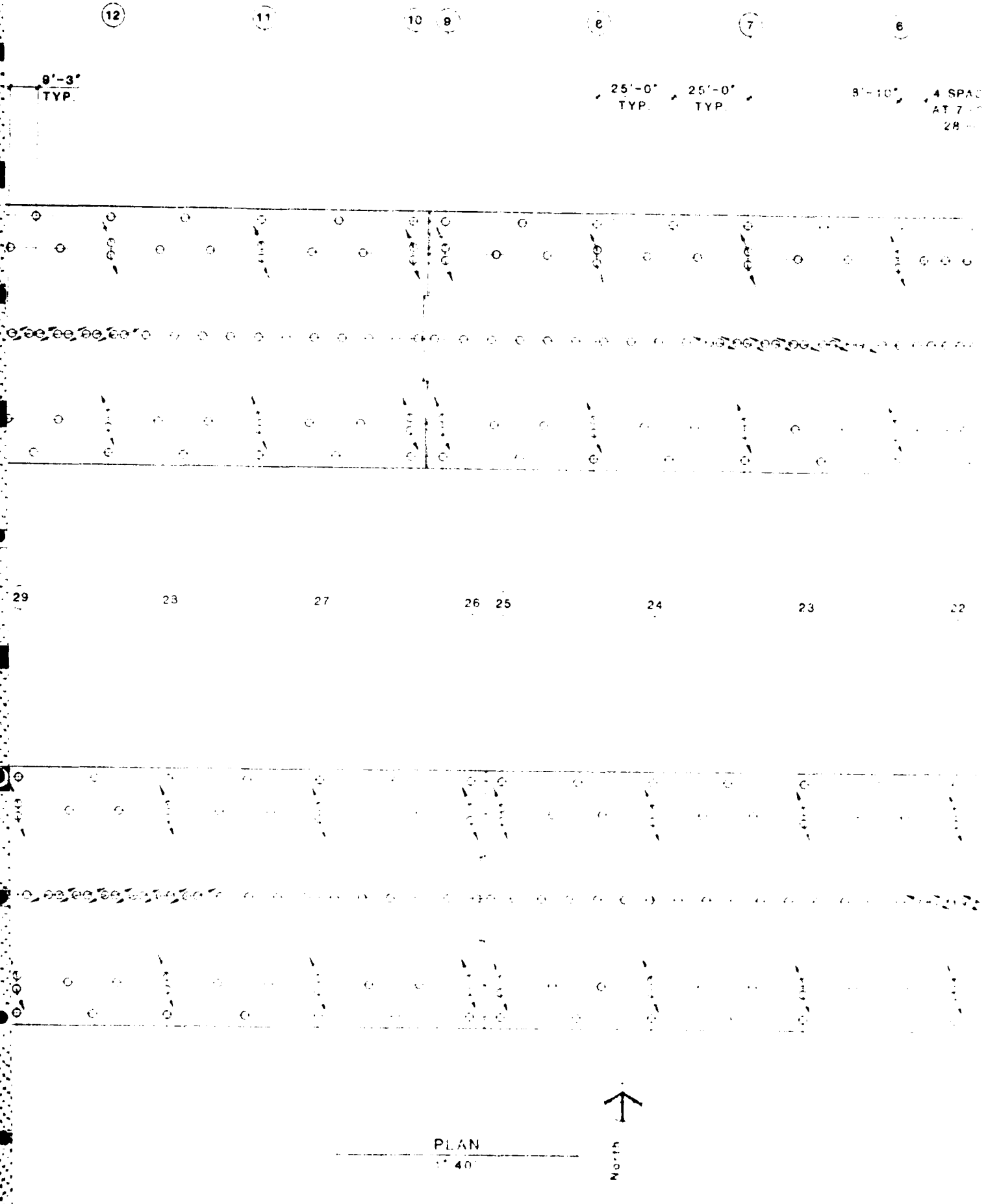
4.2.4 RECOMMENDATIONS

It is recommended that the damaged piles be replaced and that the deck areas in the damaged pile vicinity between Lines A and B and D and E be restricted for any live loads until the repairs are completed.

At the spall areas, it is recommended that the loose or cracked concrete be removed, the reinforcing steel cleaned of rust, supplemented if needed, and a gunite surface placed over the areas. It is the writers understanding that a repair contract is presently under way to repair this pier. Reinspection of the pier should be planned in six years.

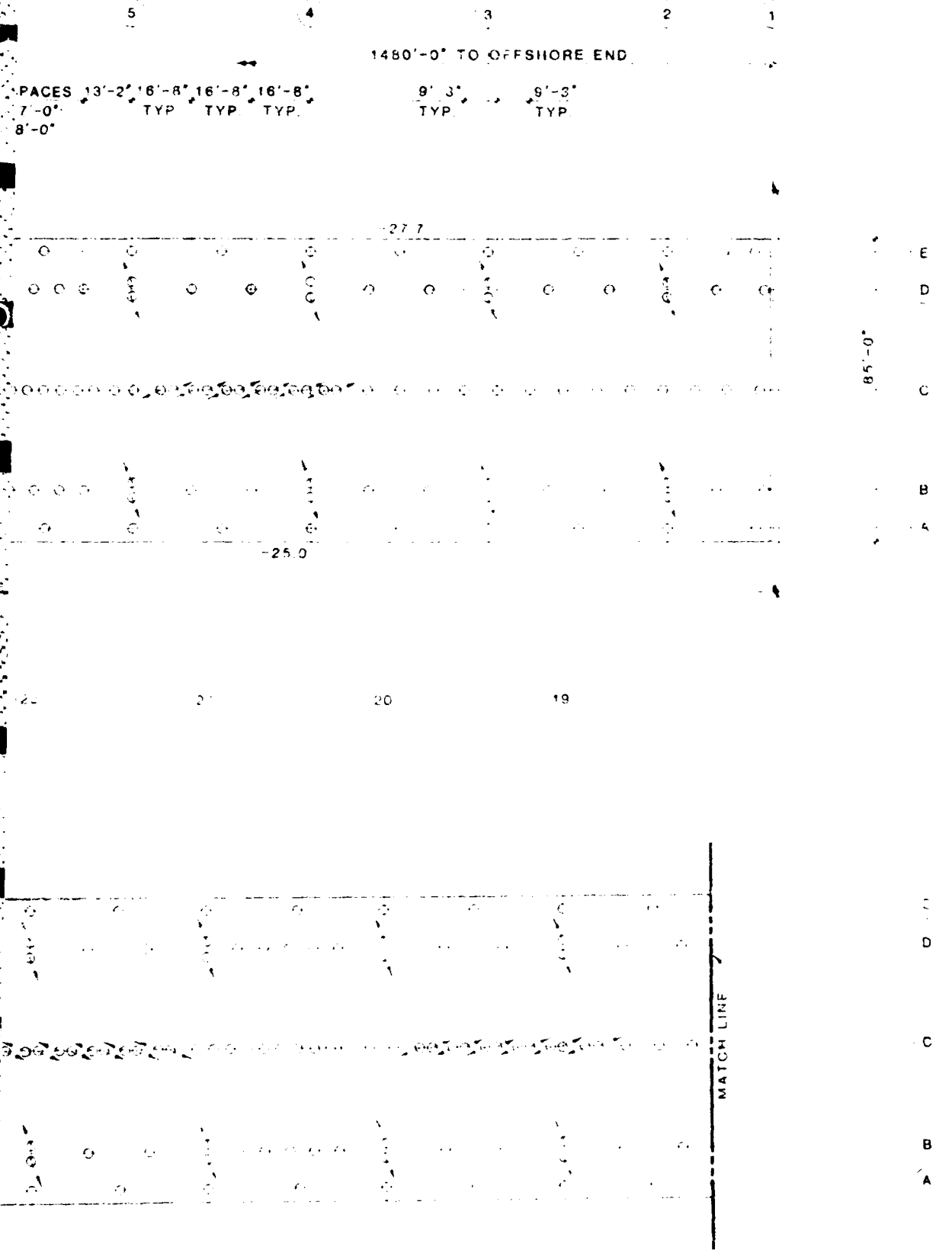

18
17
16
15
14
13
4'-8" TYP
4'-8" TYP
9'-3" TYP
9'-3" TYP
E
D
C
B
A
MAT LINE
33
32
31
30
29
1480'-0" TO INSHORE END


18" OCT PILE
E
D
C
B
A
85'-0"
31'-0"
18" OCT PILE


12
11
10
9
8
7
6
9'-3" TYP.
25'-0" TYP.
25'-0" TYP.
8'-10"
4 SPAC
AT 7
28
29
23
27
26
25
24
23
22

PLAN

1" = 40'



12" PRE
CONC. C

EL +14

EL +6.5

EL 0.0
M L L W

18" OCT
CONC.
TYPICA

16" OCT
CONC

WOOD
PILES

APPRO
BOTTO
CONFIG

EL -66

EQUALLY SPA
PRESTRESSING
STRANDS

#
GA WIRE
SPIRALS

NOTES

1 INDICATES 16" OR 18" OCTAGONAL PRESTRESSED CONC PILE

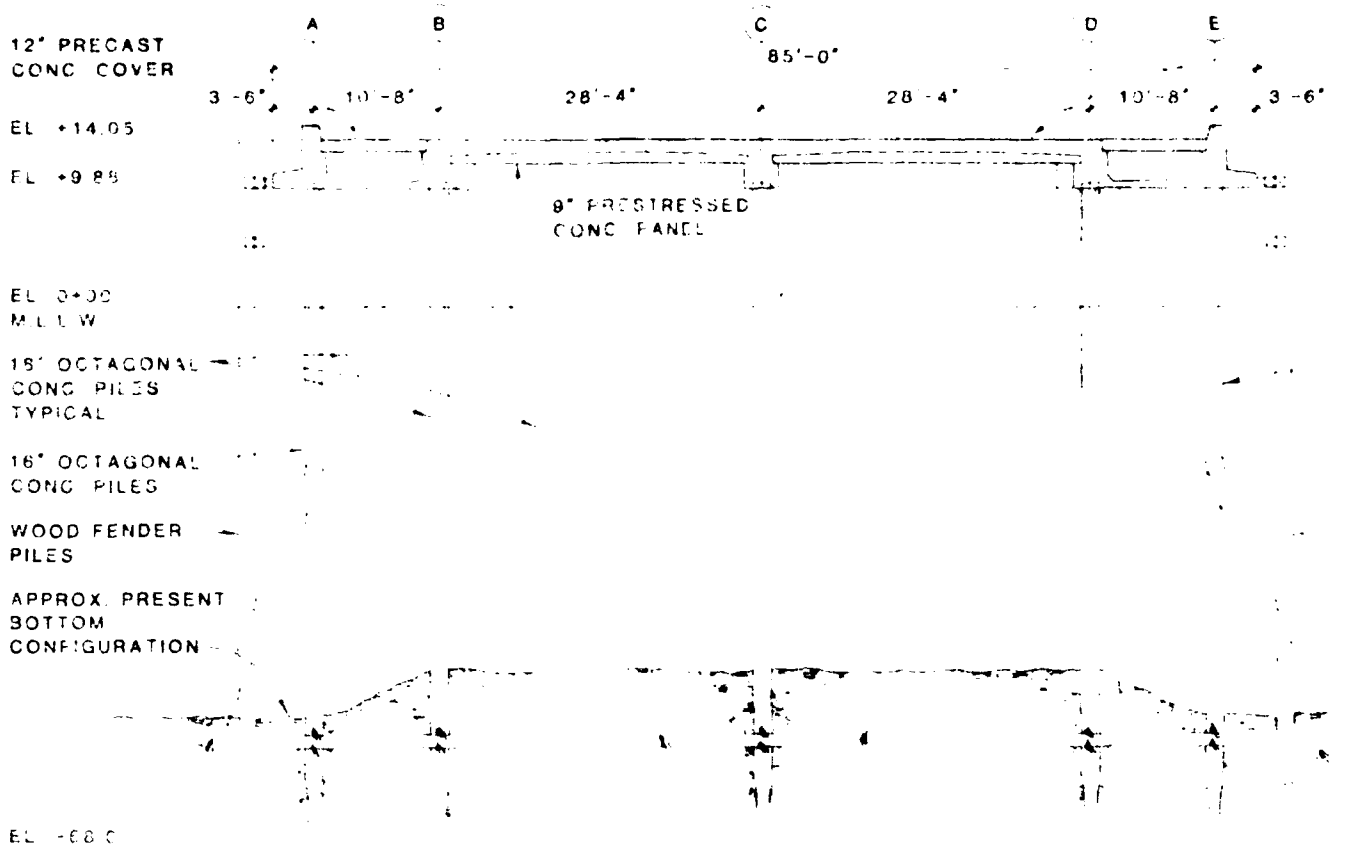
2 INDICATES 18" OCTAGONAL PRESTRESSED CONC BATTER PILE

3 -27.7 INDICATES MUD LINE ELEVATION, MEAN LOWER LOW WATER DATUM EL 0+0

NOTES (Co

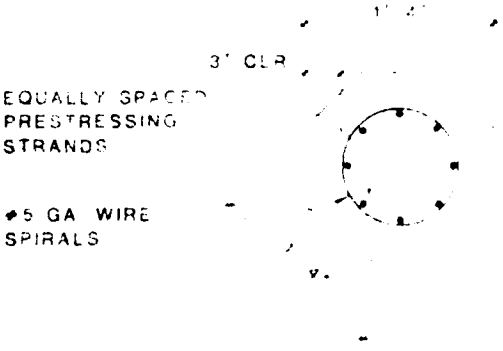
4 AT LINES
UNLESS N
AT LINES

5 EL +14.0
GRADE AT



TYPICAL PIER SECTION

1/16" 1'-0"



PILE - SECTION "A"

3/4" 1'-0"

PRESTRESSING NOTES

CONCRETE

f'c 6000 psi

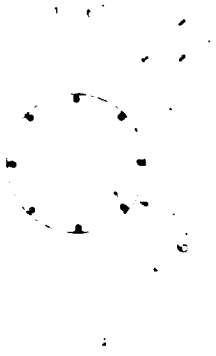
PRESTRESSING STRANDS

1/2" DIA. MAXIMUM

RESIDUAL FINAL PRESTRESS

VERTICAL PILES 600 psi

BATTER PILES 1000 psi



PILE - SECTION "B"

3/4" 1'-0"

NOTES (Cont'd)

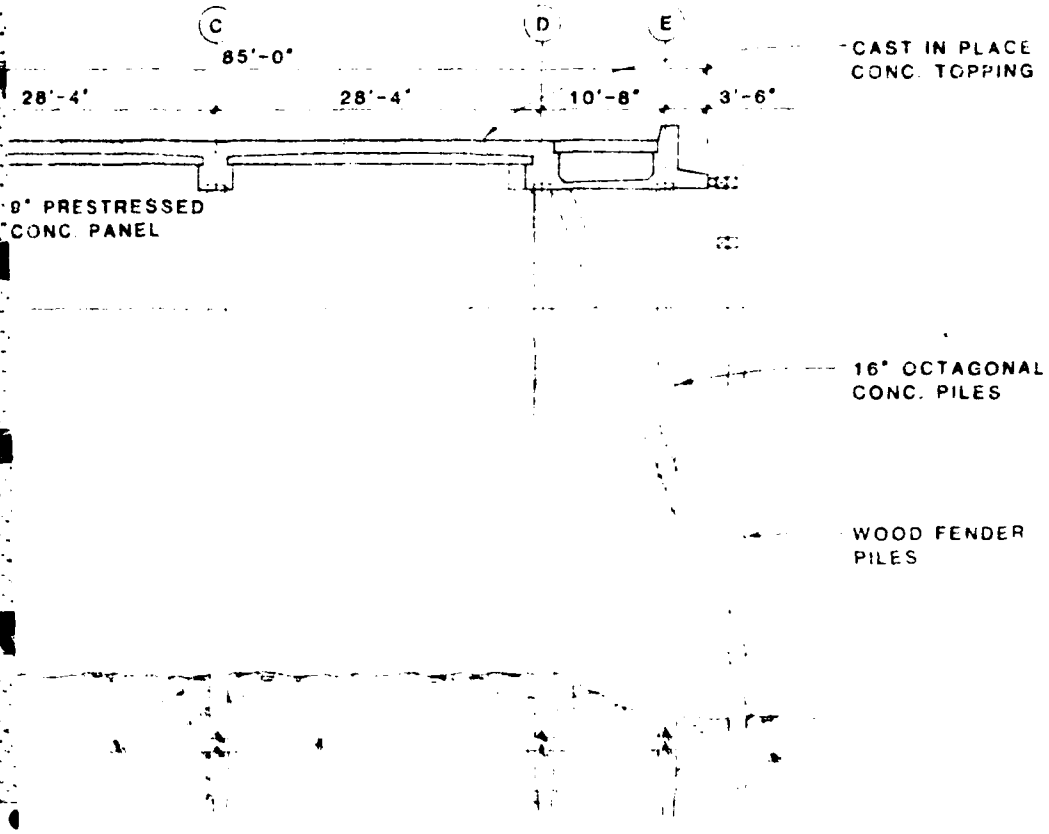
4. AT LINES A AND E ALL PILES ARE 16" OCTAGONAL UNLESS NOTED OTHERWISE
   AT LINES B, C AND D ALL PILES ARE 18" OCTAGONAL
5. EL. -14.05 INDICATES AVERAGE PIER ELEVATION, PROFILE GRADE AT CENTERLINE OF PIER IS -0.27%

PIER 7

PLAN AND TYPICAL S

U. S. NAVAL STATION, SAN DIEGO

Blaylock-Willis and Associates



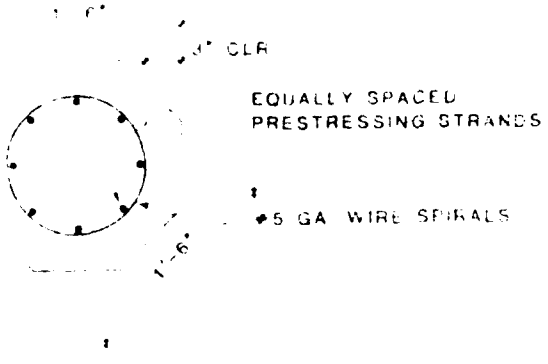
TYPICAL PIER SECTION
1/16" 1'-0"

PRESTRESSING NOTES

CONCRETE
f'c 6000 psi

PRESTRESSING STRANDS
1/2" DIA MAXIMUM

RESIDUAL FINAL PRESTRESS
VERTICAL PILES: 800 psi
BATTER PILES: 1000 psi



PILE - SECTION "B"
3/4" 1'-0"

-ONAL.
TAGONAL
ROFILE

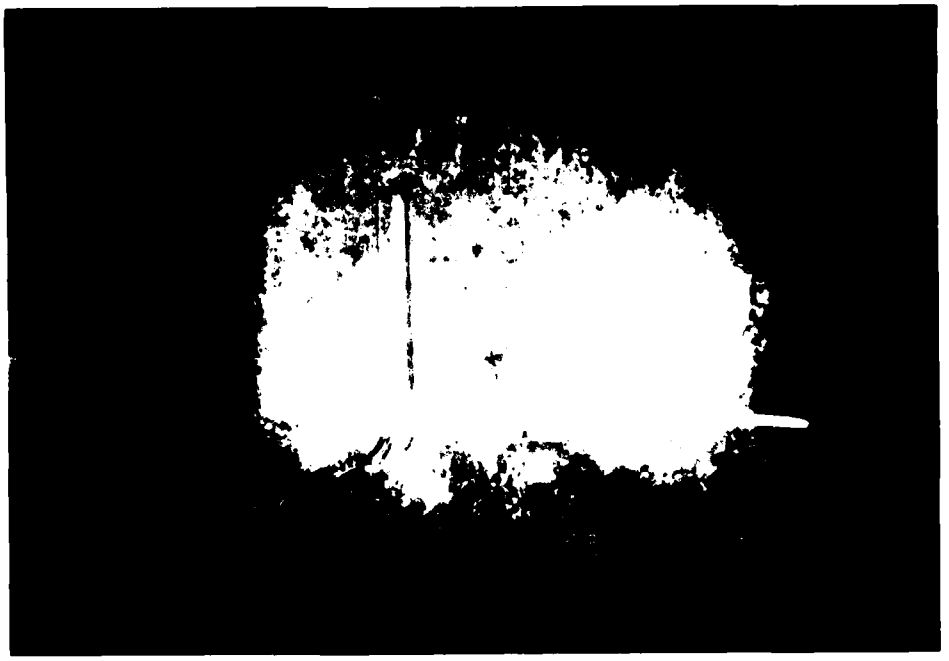
PIER 7
PLAN AND TYPICAL SECTIONS
U. S. NAVAL STATION, SAN DIEGO, CALIFORNIA

Blaylock-Willis and Associates
STRUCTURAL ENGINEERS SAN DIEGO, CALIFORNIA

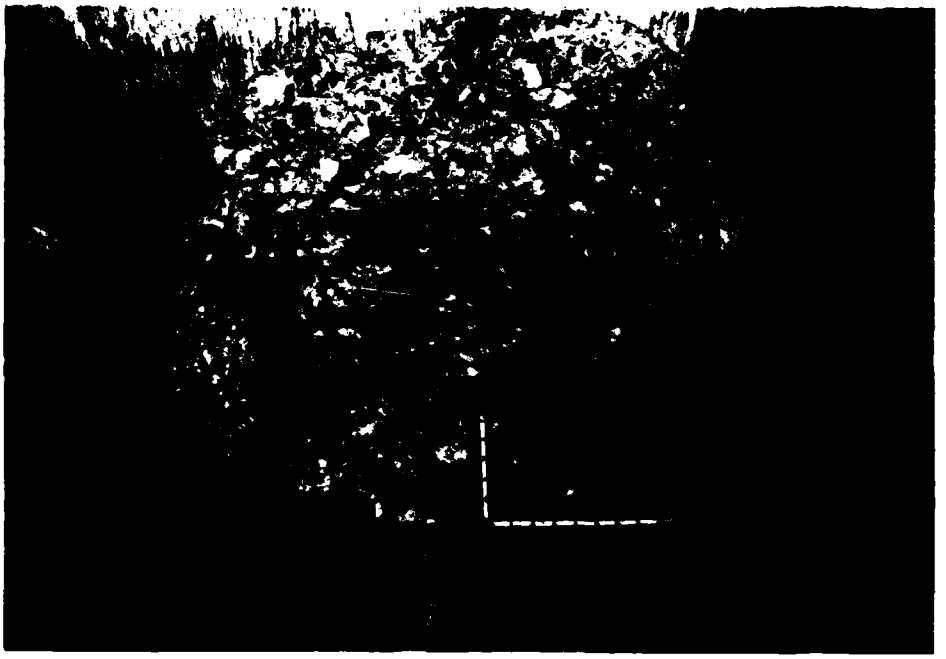
DATE
DEC 1984

FIG. 7

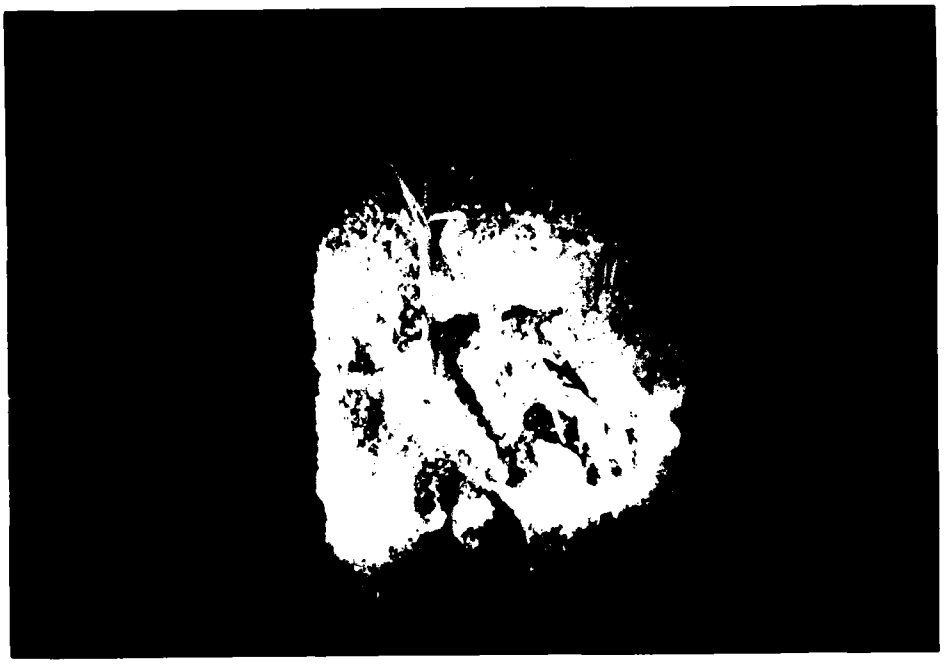
3. Pier 7 at Naval Station, San Diego, California. Picture is taken to the northwest.



4. Pier 7, Pile 24.7-D. Picture is of cleaned band just below MLW. Concrete is hard with no evidence of sulphate erosion.



5. Pier 7, Pile 24-E. Upper 8 feet of pile is missing. The pile dowel bars are shown at the underside of the utility tunnel.



6. Pier 7, Pile 24-E. Picture shows the stub end of broken pile below water. Spiral reinforcement and severed prestress strands are exposed.

7. Pier 7, Pile 24.5-E in center foreground. New pile cap for broken piles at Lines 25 and 26 can be seen behind and to left of 24.5-E. New cap spans an expansion joint.

8. Pier 7, Pile 24.5-E. Picture shows upper break in the pile and accompanying spall in the underside of the edge beam and utility trench.

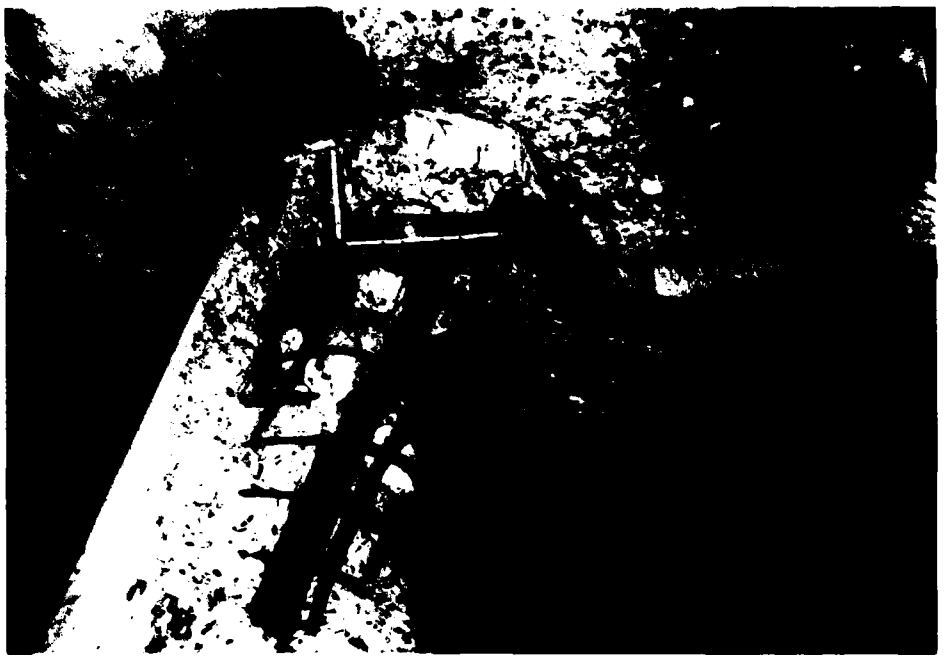
9. Pier 7, Pile 25-E and 26-E. The locations of the missing piles 25-E and 26-E are indicated by black smudges on the underside of the deck. The replacement structure comprising a new cap on two new piles are located to the left of the old pile locations. An expansion joint in the Pier can be seen near midspan of the new cap. The far half of the new cap appears to be separated from the underside of the deck with asphaltic impregnated paper allowing some movement of the expansion joint. Paper can be seen in background.

10. Pier 7, Pile 26.5-E. The upper part of pile is missing. Nothing remains above water. This spall at the underside of the utility tunnel marks the location. Broken pile dowels and horizontal deck reinforcement can be seen.

11. Pier 7, Pile 27-E. Two broken piles occupy this location. The original pile is on the right, the replacement pile on the left. Neither pile is now capable of sustaining vertical load.

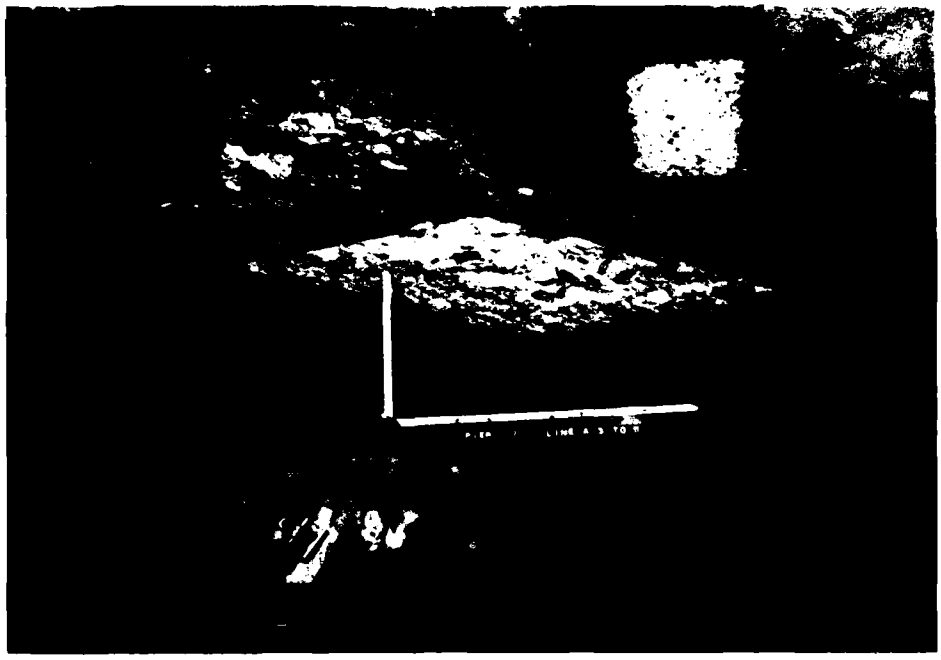
12. Pier 7, Pile 27.5-E. Pile section above water is missing. The original location is marked by a heavy spall and exposed reinforcing bars.

13. Pier 7, Pile 28-E. This pile is broken at the top and at the water line with a dogleg deflection of about 16 inches at the water line.



14. Pier 7, Pile 28.5-A. This pile is broken typically at the top and water line with the top also severely displaced inboard.

15. Pier 7, Pile 29-A. The pile is broken at the top and at the water line. While it is not so badly displaced as most of the broken piles, it is not considered capable of sustaining load.



16. Pier 7, Pile 2-A. The underside of the utility trench and edge beam between Lines 1 and 3 have insufficient cover on the reinforcing steel resulting in rusting and concrete spalling.

4.3 PIER 9

4.3.1 DESCRIPTION OF THE FACILITY

Pier 9 is located at the Naval Training Center, San Diego, California, about 100 feet north of the south boundary intersection with San Diego Bay. It is oriented with principal axis east and west.

The Pier is 630 feet in total length. It is composed of an interesting array of elements. Essentially, there are three concrete platforms tied together by wooden catwalks (see plan layout this section). Additionally, a floating wooden platform is located near the landside end of the Pier and a small wooden pump platform abuts the central concrete platform. All concrete platforms are concrete pile supported and all fixed catwalks and pump platform are wood pile supported. The concrete piles are 14" squares, conventionally reinforced. The wooden piles were specified to be 15 inch minimum butt diameter in 1973 repair and replacement drawings (see PWC Dwg. No. 17970 through 17977, Work Request O1-407). The original drawings for the Pier were not available.

4.3.2 OBSERVED CONDITIONS

The Pier is in fair condition. As indicated in Table 5.2, "Record of Structural Assessment", most of the wooden piles rate "good" in the scale of pile condition described in Section 3.

Many of the wood piles are wrapped in plastic polyvinyl sheets (commercial name Pile-Gard) which is intended to protect the pile from marine borer damage. In a majority of the cases, the wrapping was torn. In other cases, the wrapping does not extend to the mudline. It is the writers opinion that while the most vigorous borer activity occurs in the higher water elevations some

considerable damage occurs between the mudline and middepths. For this reason, it is most suitable to cover the entire length of the pile exposed to the water. This in many places has not been done.

Six wood piles were found which rated as "bad" on the scale of condition related to borer erosion. Two other piles (22-B and 25-A) have been struck from outboard side resulting in splits at cap connection - one of these has been displaced from under the cap.

The concrete piles of the three concrete platforms were found to rate "firm" in the scale of condition described in Section 3 for concrete piles. Any sulphate ion damage was restricted to the outer surfaces of the piles.

Five piles exhibit bleeding cracks near their intersections with the concrete decks suggestive of driving fractures. The rust bleeds indicate rusting of the reinforcing - a condition that will get progressively worse. Two piles were noted at the outer concrete platform which have experienced shear failure at their intersections with the concrete deck. The piles have displaced exposing vertical reinforcing.

4.3.3 STRUCTURAL CONDITION ASSESSMENT

The six wood piles rated "bad" are not considered to be capable of supporting their design load.

Wood Pile 25-A is split at its cap connection but is still capable of supporting its load. Wood Pile 22-B is no longer under its cap, which is presently dangerously unsupported.

The concrete piles exhibiting the bleeding cracks are considered weakened but not dangerously so at present.

The broken piles at the outer platform are considered capable of supporting only a very small vertical load and are considered a dangerous condition if normal service activities are planned at this area of the Pier.

4.3.4 RECOMMENDATIONS

It is recommended that:

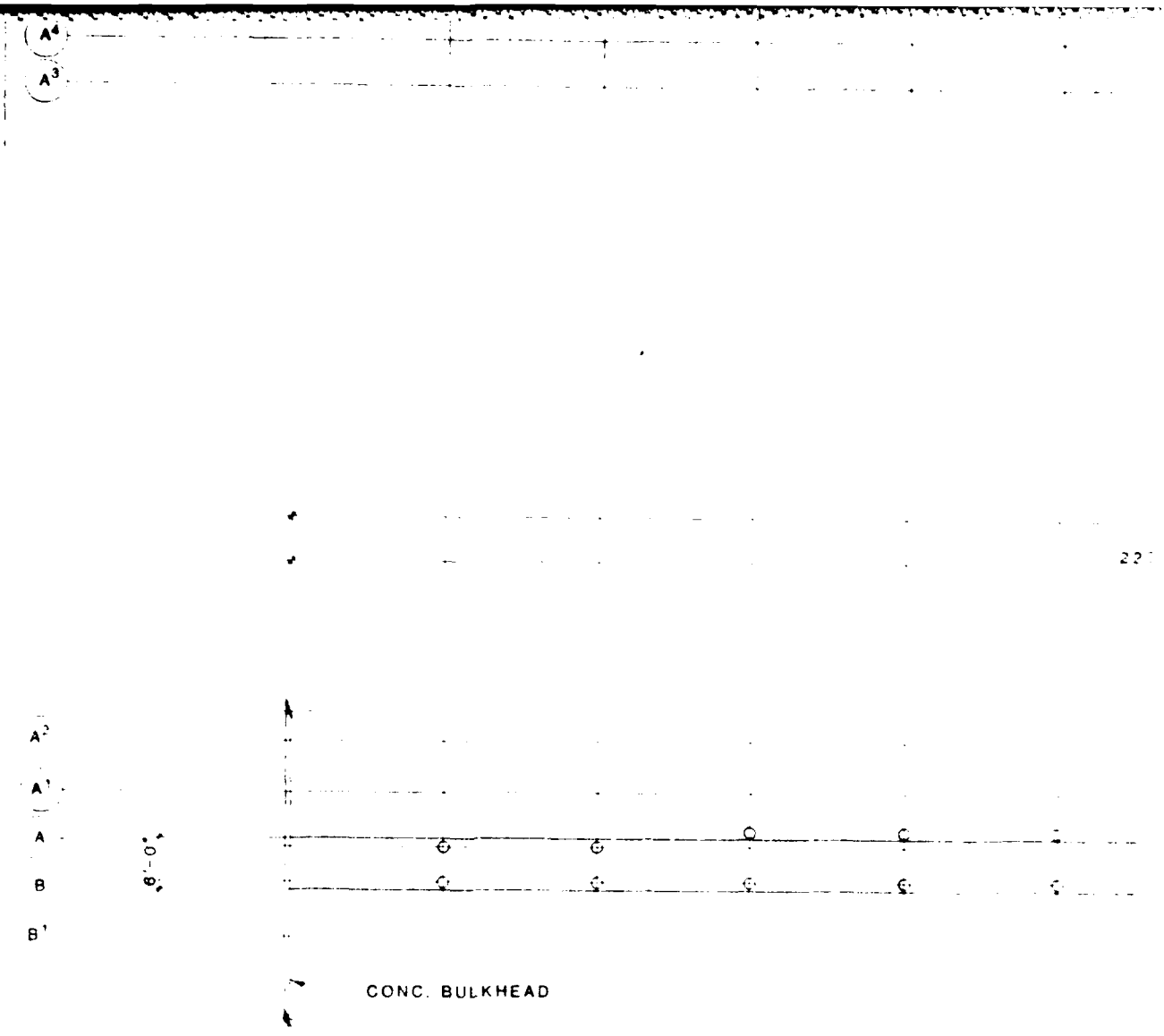
1. The six "bad" wood piles be replaced or concrete jacketed and that the remaining piles presently wrapped incompletely or with torn wrapping be completely wrapped or jacketed. Split pile 25-A can be repaired by stitch bolting. Split pile 22-B must be replaced. The estimated cost of this repair is $30,000.

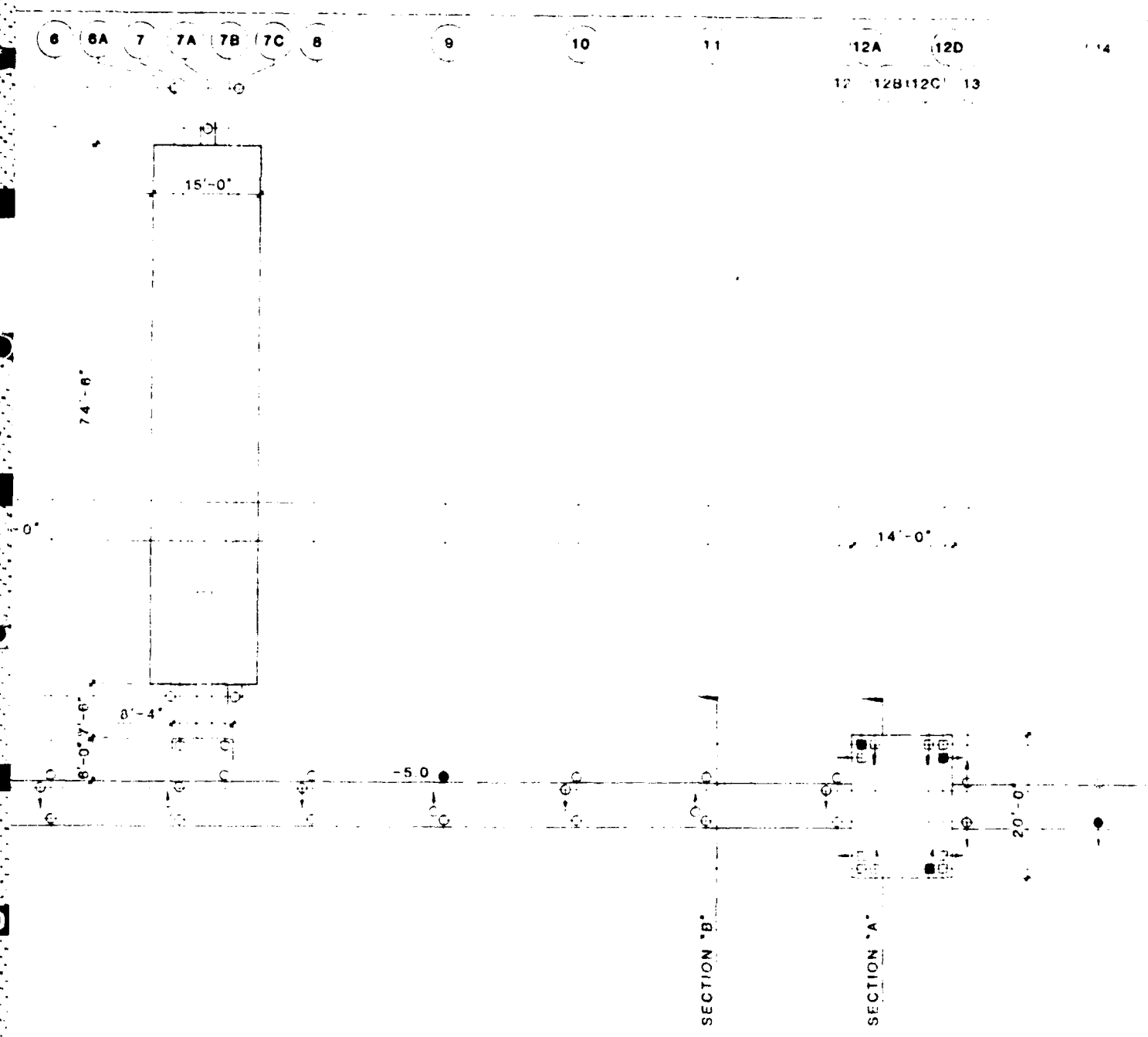
The two severely damaged concrete piles should be replaced or encased with a reinforced concrete encasement. Cost of replacing concrete piles is estimated to be $28,100.

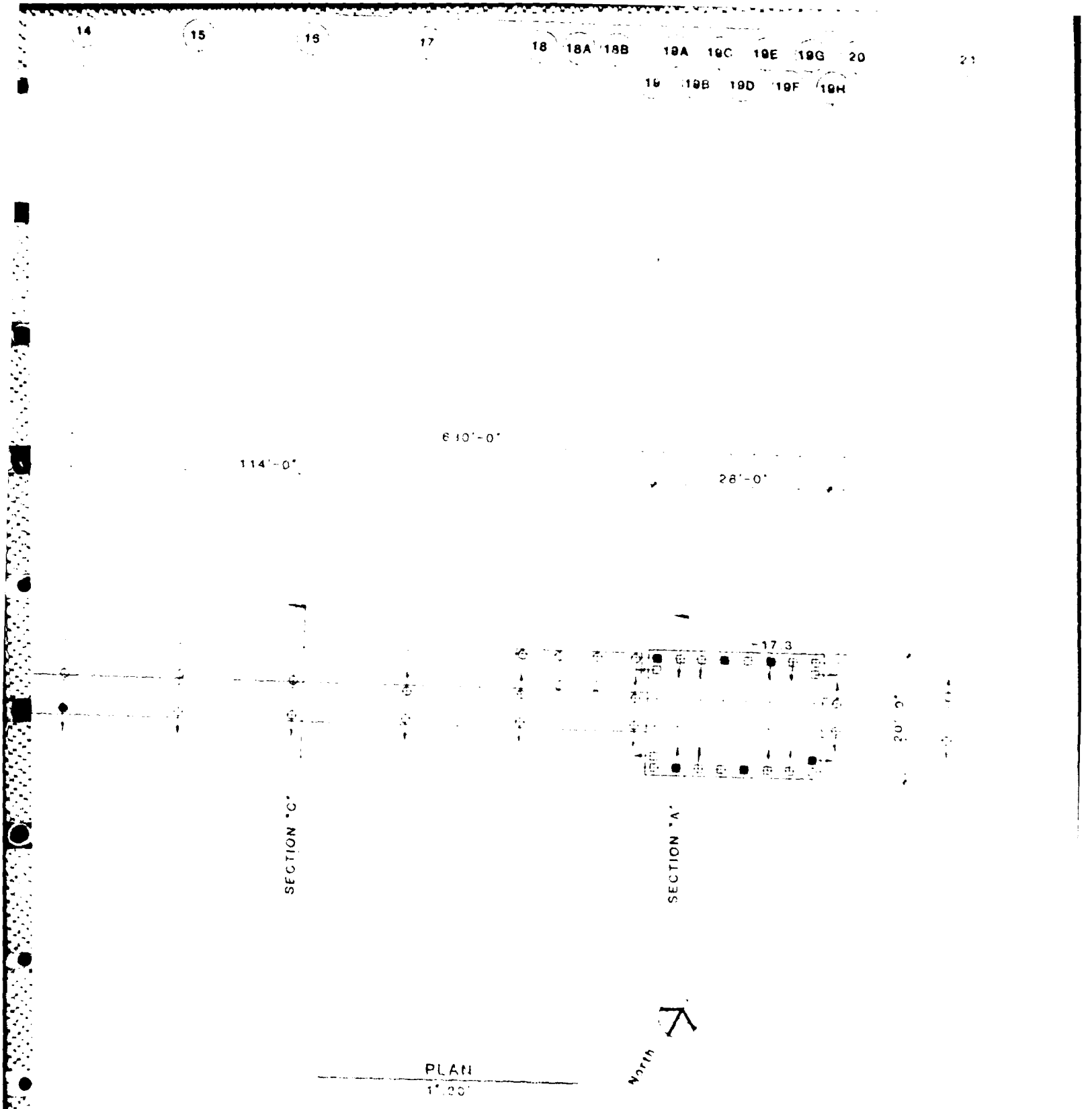
2. The cracked and bleeding concrete piles be repaired possibly with a sequence which will include removing the cracked concrete, cleaning the exposed reinforcement and replacing the concrete cover with gunite material. The estimated cost of this repair is $12,000.

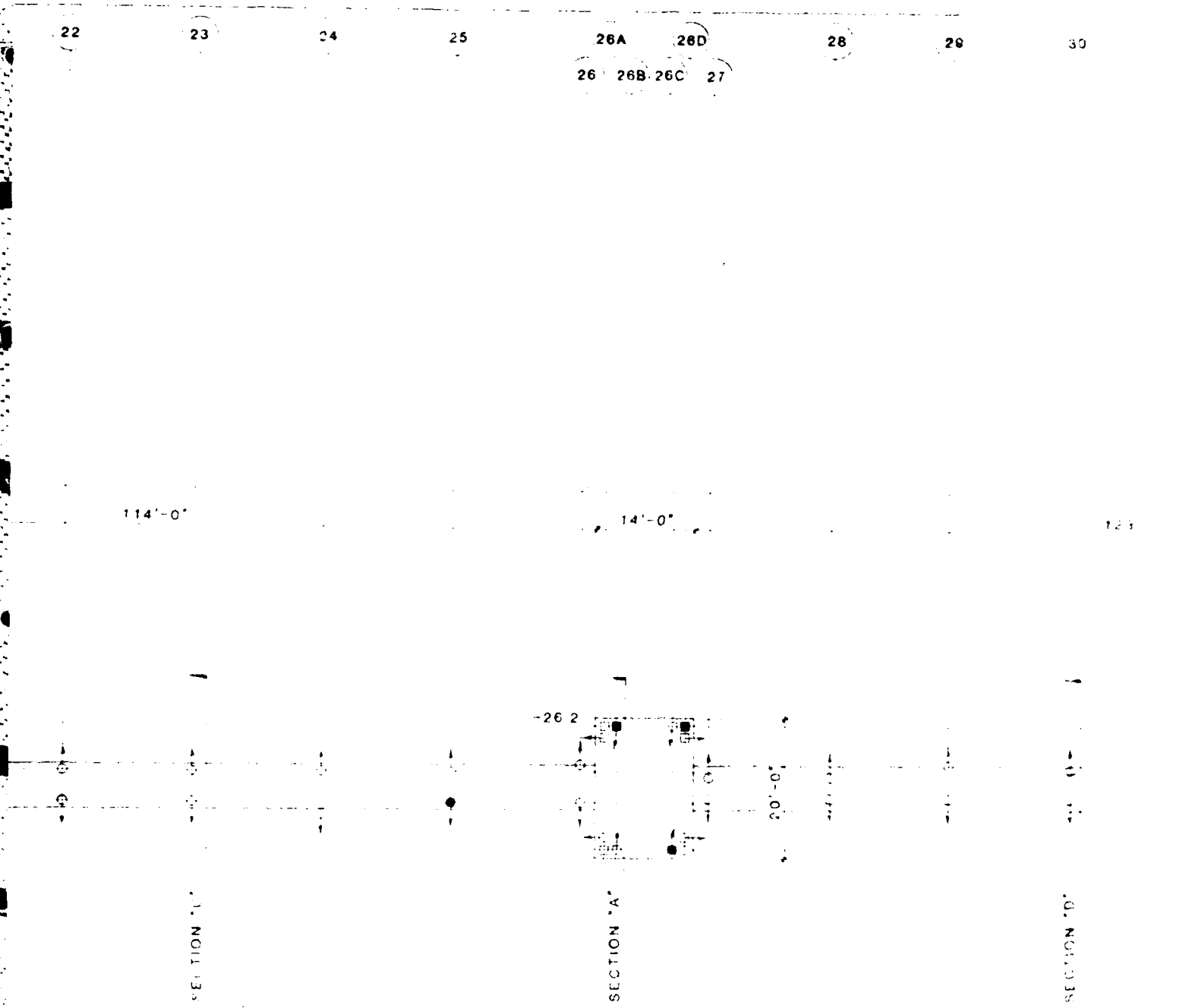
The total estimated cost of items 1 and 2 is $70,100 (See Section 5 for a more detailed cost estimate).

3. The Pier be inspected again in three years.


A4
A3
22'
A2
A1
A
B
B1
8'-0"
CONC. BULKHEAD

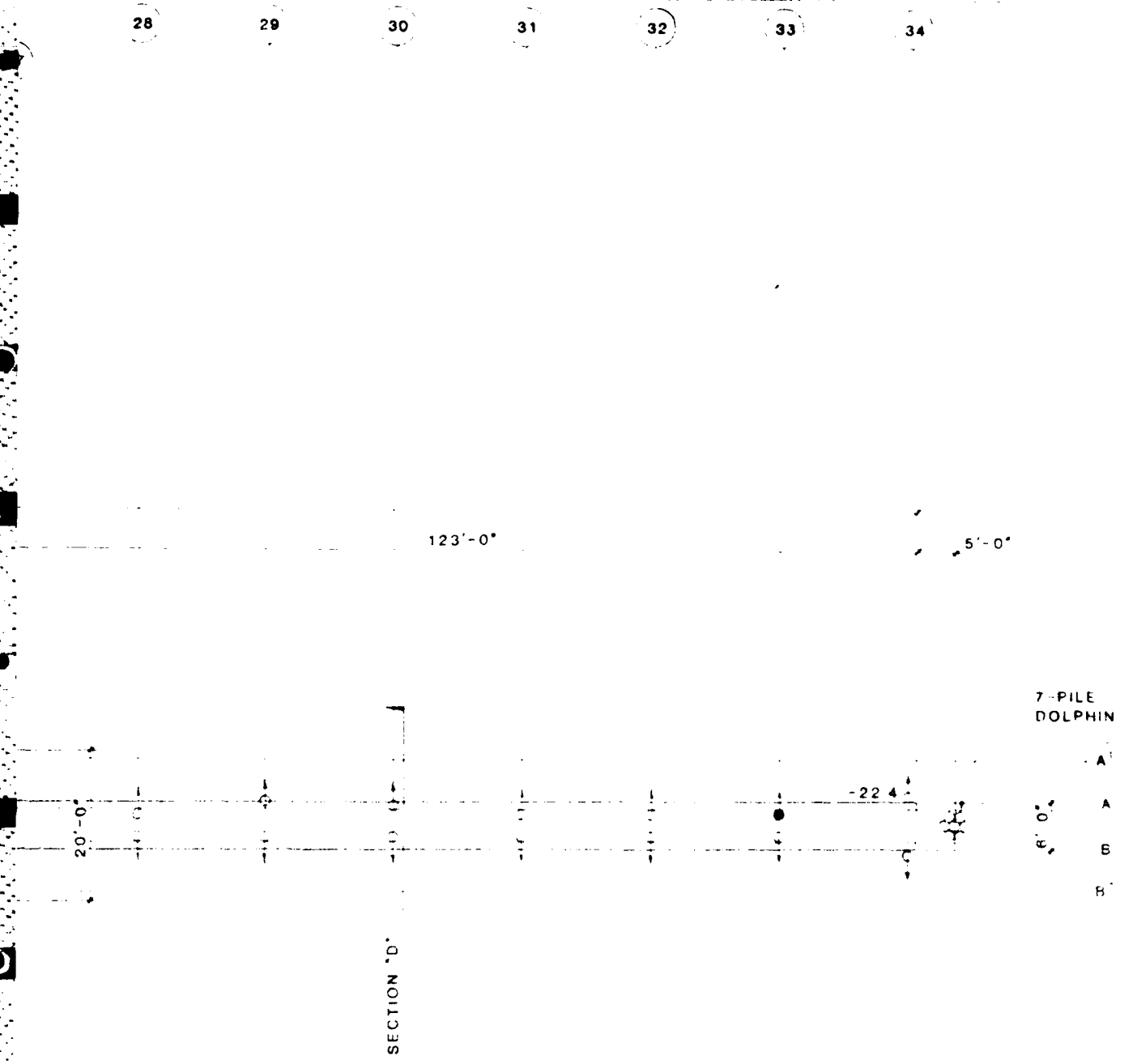

6
6A
7
7A
7B
7C
8
9
10
11
12A
12D
12
12B
12C
13
15'-0"
74'-6"
14'-0"
8'-4"
6'-0"
7'-6"
-5.0
20'-0"
SECTION "B"
SECTION "A"


14
15
16
17
18
18A
18B
19A
19C
19E
19G
20
19
19B
19D
19F
19H
21
610'-0"
114'-0"
28'-0"
-17.3
20'-0"
SECTION "C"
SECTION "A"
North
PLAN
1" 20'



NOTES

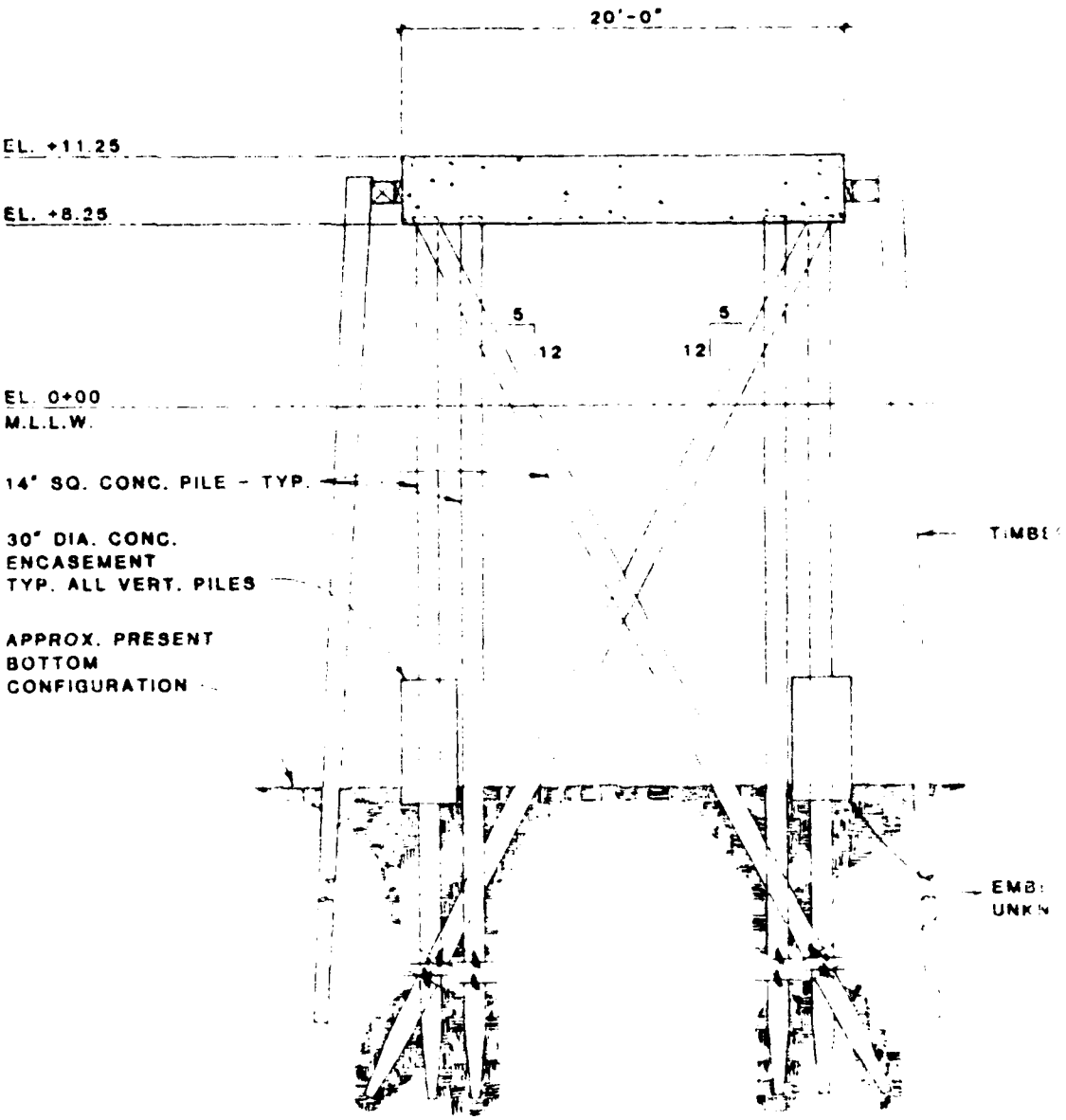
1. ▭ INDICATES 14" SQ. PRECAST CONC. PILE
2. ▭ INDICATES 14" SQ. PRECAST CONC. BATTER PILE
3. ○ INDICATES TIMBER PILE, 14" MIN. BUTT DIA.
4. ○ INDICATES TIMBER BATTER PILE, 14" MIN. BUTT DIA.
5. ■, ● INDICATES CLEANED PILE
6. — FOR SECTIONS CUT ON THIS PLAN SEE FIG. 9
7. -22.4 INDICATES MUD LINE ELEVATION
   MEAN LOWER LOW WATER DATUM = EL. 0+00



PIER 9 - PLAN

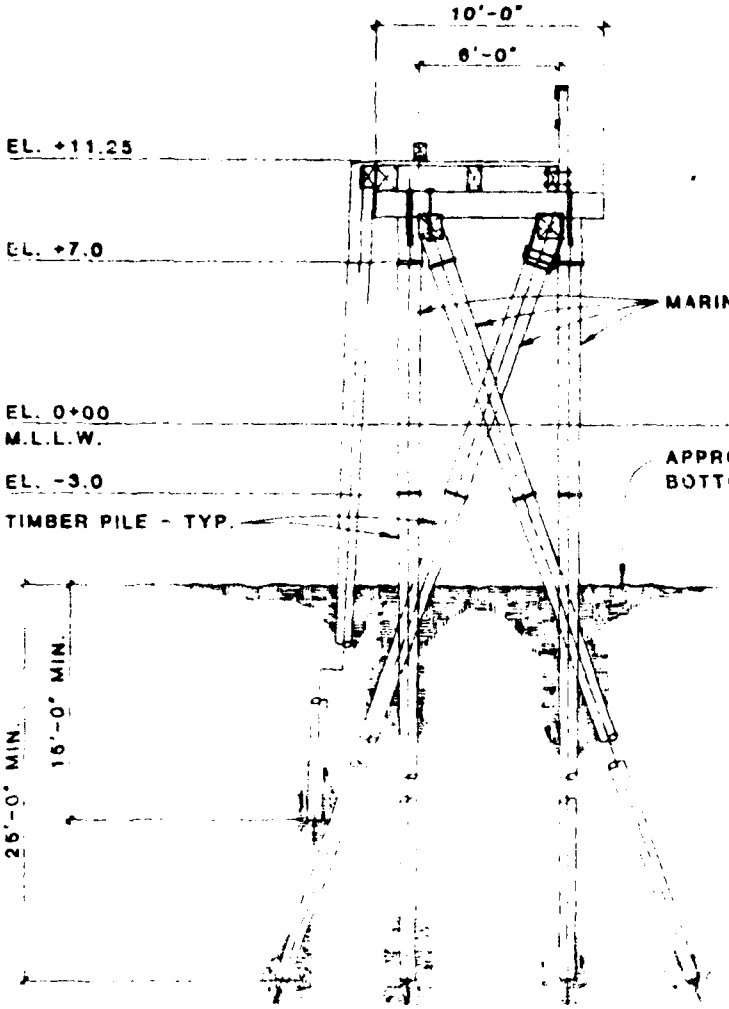
U. S. NAVAL STATION, SAN DIEGO, CALIFORNIA

Blaylock-Willis and Associates STRUCTURAL ENGINEERS SAN DIEGO, CALIFORNIA	DATE DEC. 1984	FIG. 8

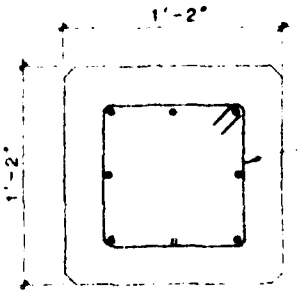


SECTION "A"

1/8" : 1'-0"

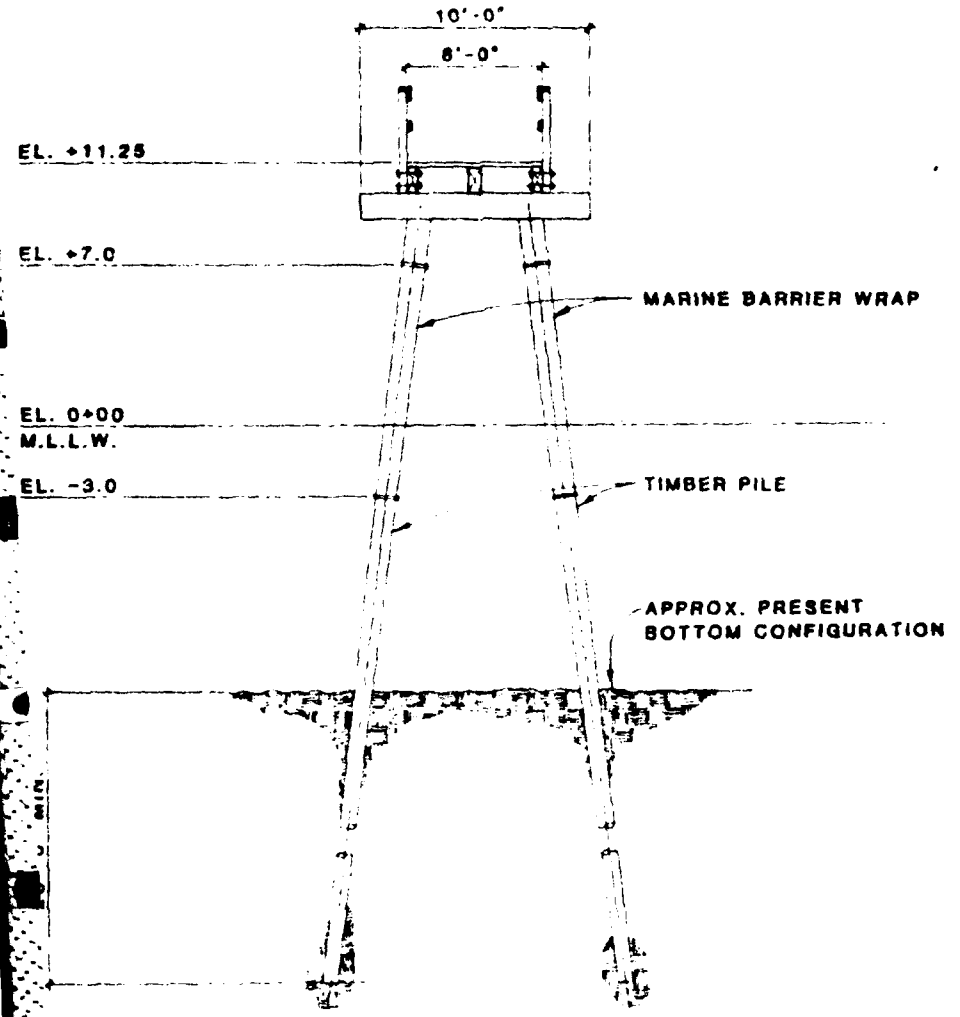


SECTION "B"
1/8":1'-0"

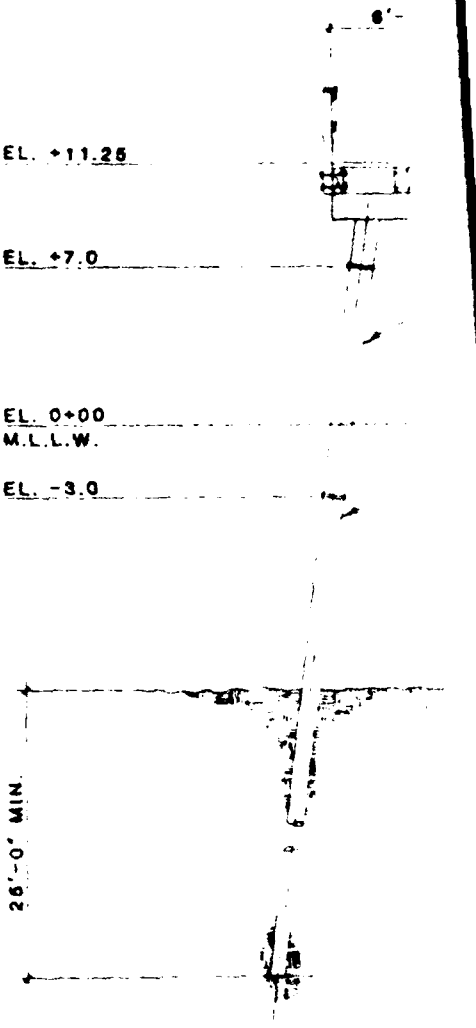


REINFORCING
CONFIGURATION
UNKNOWN

TYPICAL CONC. PILE SECTION
1":1'-0"



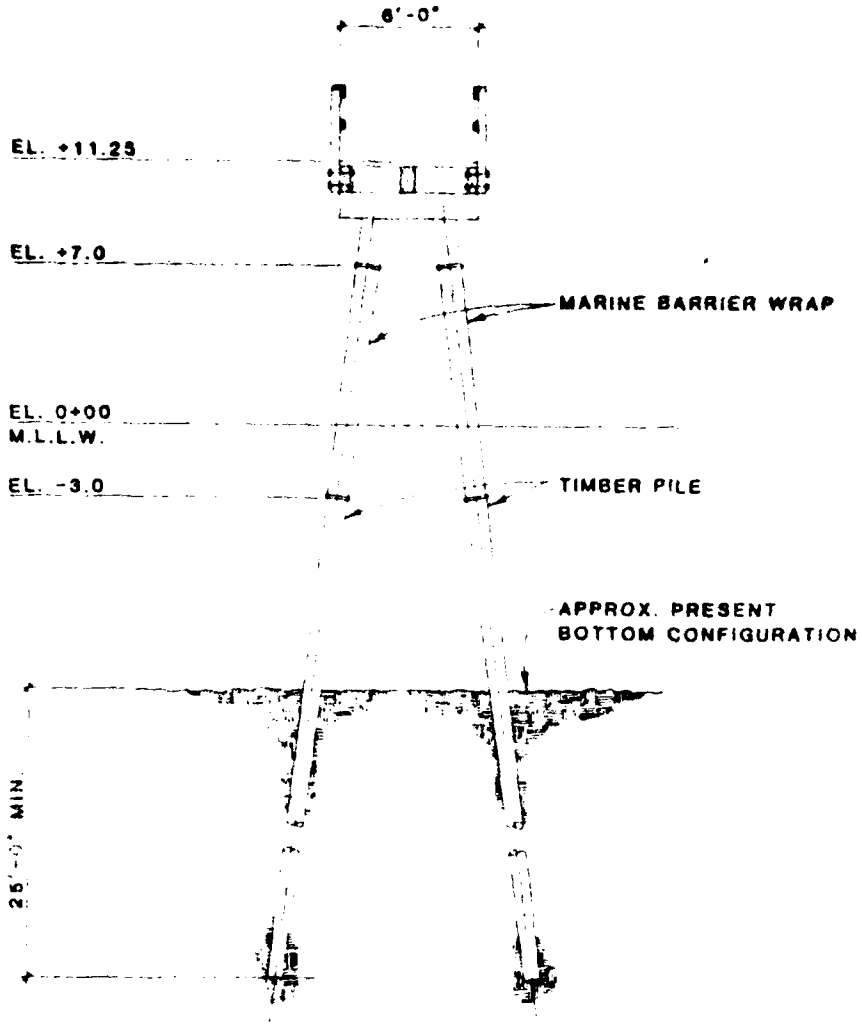
SECTION "C"
1/8":1'-0"



SECTION
1/8":1'-0"

RCING
URATION
WN

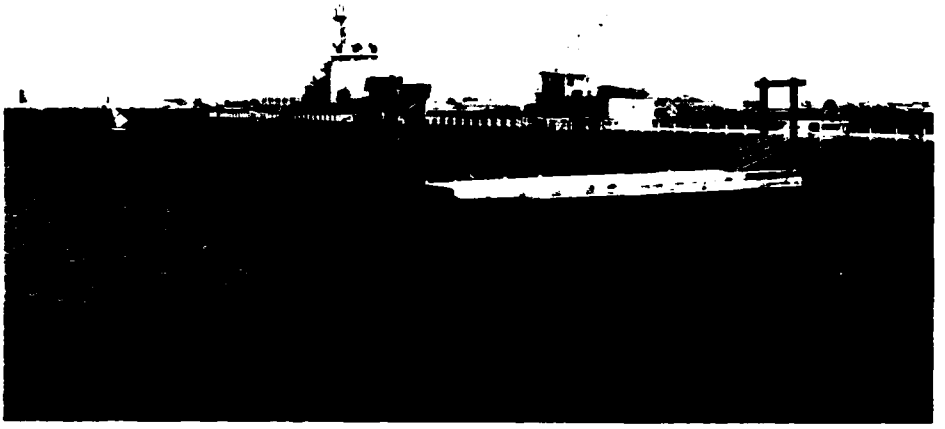
TYPICAL
U. S. NAVAL
Blaylock-Willis and A
STRUCTURAL ENGINEERS SAN



SECTION "D"
1/8":1'-0"

PIER 9
TYPICAL PIER SECTIONS
U. S. NAVAL STATION, SAN DIEGO, CALIFORNIA

Blaylock-Willis and Associates STRUCTURAL ENGINEERS SAN DIEGO, CALIFORNIA	DATE: DEC. 1984	FIG. 9



17. Pier 9. Naval Station property located at Naval Training Center, San Diego, California. The picture is of north side of the Pier on a calm day.

18. Pier 9. Picture is of the south side of the Pier. The broken displaced Pile 22B is the right hand pile the second bent away.

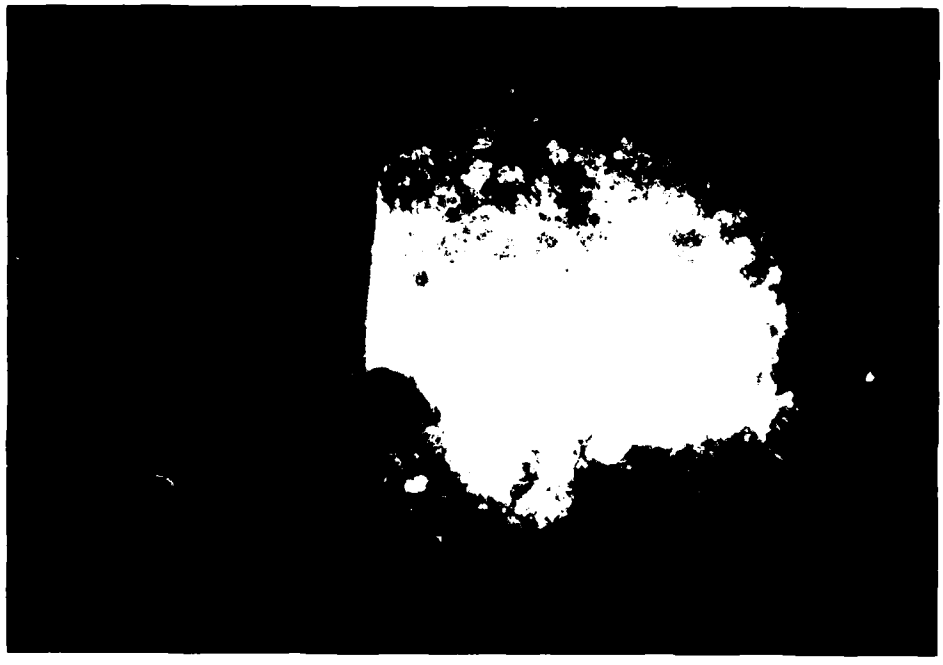
19. Pier 9, showing broken, displaced pile at Bent 22 Line B. Cap end previously supported hangs free of pile.

20. Pier 9. Picture shows split in the top of Pile 25A. Pile is considered still capable of supporting its design load but should be repaired.

21. Pier 9. Pile 26B.A[1] is the vertical pile showing cracks and ferric bleeding. The cracks have the appearance of driving fractures which have allowed moisture and chlorine ion admission to the vertical reinforcement resulting in rusting of these bars.

22. Pier 9. Pile 20A.B[1] is the damaged vertical pile in center. It has been struck from outboard and failed in shear at the deck connection exposing reinforcing steel. Pile 22D.B[1] is also broken.

23. Pier 9, Pile 12A.A[1]. Picture is of cleaned band at mid-height of the pile previous to picking pile corner with pointed hammer.



24. Pier 9, Pile 12A.A[1]. Picture taken after striking pile with pointed hammer. Resulting spall is at intersection of vertical and horizontal scales. Pile condition is considered firm with very little sulphate damage.

25. Pier 9, Pile 9A. Picture is taken just below the Pile-Gard wrapping showing a 4 inch marine borer intrusion in the side of the pile. Bottom of wrapping can be seen in top of picture. This pile replaced a former pile at this location in 1973 repairs to Pier.

26. Pier 9, Pile 7.A[1] (scale designation 7-D changed to 7.A[1]). Picture shows severe borer damage to wooden pile.

SECTION 5 - APPENDICES

5.1 PERSONNEL ON PROJECT

1. Chesapeake Division Personnel:
   Phillip Scola - Program Manager
   Wade Casey - EIC

2. Blaylock-Willis and Associates Personnel:
   A.J. Blaylock - Civil/Structural Engineer, Diver
   James Willis - Civil/Structural Engineer, Diver
   Daniel McNaughton - Civil/Structural Engineer, Diver
   Matthew Martinez - Civil Engineer, Diver
   Carson Creecy - Civil Engineer, Diver
   Thomas Spencer - Civil Engineer, Diver

3. Studio B Photography Personnel:
   Lee Peterson - Underwater Photographer

5.2 TABLES OF STRUCTURAL ASSESSMENT

TABLE 5.1

RECORD OF STRUCTURAL ASSESSMENT

PIER 2

DESCRIPTION OF PILE CONDITION				
PILE	**TOP**	**MIDDLE**	**BOTTOM**	**STRUCTURAL COMMENTS**
13A	-------	-------	-------	Vertical crack at north and south faces, approximately 15' long, starting 10' above mudline.
33A	-------	-------	-------	Horizontal crack with bleeding 3' from top of pile.
4A to 23A	-------	-------	-------	Steel Z shaped sheet pile, extending approximately 3' above mudline.
General	-------	-------	-------	Occasional grout repairs.

TABLE 5.2

RECORD OF STRUCTURAL ASSESSMENT

PIER 7

DESCRIPTION OF PILE CONDITION				
PILE	**TOP**	**MIDDLE**	**BOTTOM**	**STRUCTURAL COMMENTS**
1A to 3A	-------	-------	-------	Spalling with exposed reinforcing along longitudinal beam.
24E	-------	-------	-------	Broken, top and MLW 8' stub removed.
24.5E	-------	-------	-------	Broken, top and MLW
24.8E	-------	-------	-------	New octagonal pile with pile cap beam.
25E	-------	-------	-------	Broken, top and MLW stub removed.
26E	-------	-------	-------	Broken, top and MLW stub removed.
26.2E	-------	-------	-------	New octagonal pile with pile cap beam. Paper is between beam and pier.
26.5E	-------	-------	-------	Broken, top and MLW stub removed.
27E	-------	-------	-------	Original pile broken, top and MLW.
27E	-------	-------	-------	Replacement pile broken, top and MLW.
27.5E	-------	-------	-------	Broken, top and MLW stub removed.
28E	-------	-------	-------	Broken, top and MLW.
28.5A	-------	-------	-------	Broken, top and MLW slab also damaged.
29A	-------	-------	-------	Broken, top and MLW slab also damaged.
33E	-------	-------	-------	10' vertical crack at north face. Starting approximately 10' below pile cap.

TABLE 5.3

RECORD OF STRUCTURAL ASSESSMENT

PIER 9

DESCRIPTION OF PILE CONDITION				
PILE	**TOP**	**MIDDLE**	**BOTTOM**	**STRUCTURAL COMMENTS**
1A	-------	-------	-------	Pilegard wrap to mudline.
1B	-------	-------	-------	Pilegard wrap to mudline.
2A	-------	-------	-------	Pilegard wrap to mudline.
2B	-------	-------	-------	Pilegard wrap to mudline.
3A	-------	-------	-------	Pilegard wrap to mudline.
3B	-------	-------	-------	Pilegard wrap to mudline.
4A	-------	-------	-------	Good. Pilegard wrap. Pile exposed below.
4B	-------	-------	-------	Good. Pilegard wrap. Pile exposed below.
5A	-------	-------	-------	Good, 1" marine borer damage. Pilegard wrap. Pile exposed below.
5B	-------	-------	-------	Good. Pilegard wrap. Pile exposed below.
6A	-------	-------	-------	Good. Pilegard wrap. Pile exposed below.
6B	-------	-------	-------	Good. Pilegard wrap. Pile exposed below.
6A.A[2]	-------	-------	-------	Good
6A.A[4]	-------	-------	-------	Good
7A	-------	-------	-------	Good. Pilegard wrap. Pile exposed below.

TABLE 5.3

RECORD OF STRUCTURAL ASSESSMENT

PIER 9

DESCRIPTION OF PILE CONDITION				
PILE	**TOP**	**MIDDLE**	**BOTTOM**	**STRUCTURAL COMMENTS**
7.A[1]	-------	-------	--------	Fair, 2" marine borer damage.
7A.A[3]	-------	-------	--------	Good. Rubbing strip attached.
7B	-------	-------	--------	Good. Pilegard wrap. Pile exposed below.
7B Batter	-------	-------	--------	Good, 1" marine borer damage. Pilegard wrap. Pile exposed below.
7B.A	-------	-------	--------	Good. Pilegard wrap. Pile exposed below.
7B.A[1]	-------	-------	--------	Bad, 4" marine borer damage.
7C.A[2]	-------	-------	--------	Good. Rubbing strip loose.
7C.A[4]	-------	-------	--------	Good.
8A	-------	-------	--------	Good. Pilegard wrap. Pile exposed below.
8A Batter	-------	-------	--------	Good. Pilegard wrap. Pile exposed below.
8B	-------	-------	--------	Good. Pilegard wrap. Pile exposed below.
9A	Pilegard wrap	Bad	Bad	Bad, 8" marine borer damage. Pilegard wrap. Pile exposed below.
9B	-------	-------	--------	Good. Pilegard wrap. Pile exposed below.
9B Batter	-------	-------	--------	Good. Pilegard wrap. Pile exposed below.
10A	-------	-------	--------	Good. Pilegard wrap. Pile exposed below.

TABLE 5.3

RECORD OF STRUCTURAL ASSESSMENT

PIER 9

DESCRIPTION OF PILE CONDITION				
PILE	**TOP**	**MIDDLE**	**BOTTOM**	**STRUCTURAL COMMENTS**
10A Batter	--------	--------	---------	Good. Pilegard wrap. Pile exposed below.
10B	--------	--------	---------	Good. Pilegard wrap. Pile exposed below.
11A	--------	--------	---------	Good. Pilegard wrap. Pile exposed below.
11B	--------	--------	---------	Good. Pilegard wrap. Pile exposed below.
11B Batter	--------	--------	---------	Good. Pilegard wrap. Pile exposed below.
12A	--------	--------	---------	Good. Pilegard wrap. Pile exposed below.
12A Batter	--------	--------	---------	Fair, 1 1/2" marine borer damage. Pilegard wrap. Pile exposed below.
12B	--------	-------	---------	Good. Pilegard wrap. Pile exposed below.
12A.A[1]	Firm	Firm	Firm	18" vertical crack at south face.
12C.B[1]	Firm	Firm	Firm	
12D.A[1]	--------	--------	---------	Vertical crack with bleeding at north, east and west faces.
12D.A[1] Batter	Firm	Firm	Firm	
13A	---------	--------	---------	Fair, 1 1/2" marine borer damage. Pilegard wrap. Pile exposed below.
13B	---------	--------	---------	Good. Pilegard wrap. Pile exposed below.
14A	---------	---------	---------	Good. Pilegard wrap. Pile exposed below.

TABLE 5.3

RECORD OF STRUCTURAL ASSESSMENT

PIER 9

DESCRIPTION OF PILE CONDITION				
PILE	**TOP**	**MIDDLE**	**BOTTOM**	**STRUCTURAL COMMENTS**
14B	Good	Good	Good	Pilegard wrap. Pile exposed below.
15A	--------	--------	--------	Fair. 1 1/2" marine borer damage Pilegard wrap. Pile exposed below.
15B	--------	--------	--------	Good. Pilegard wrap. Pile exposed below.
16A	--------	--------	--------	Good. Pilegard wrap ripped. Pile exposed below.
16B	--------	--------	--------	Good. Pilegard wrap. Pile exposed below.
17A	--------	--------	--------	Good. Pilegard wrap. Pile exposed below.
17B	--------	--------	--------	Good. Pilegard wrap. Pile exposed below.
18A	--------	--------	--------	Good. Pilegard wrap. Pile exposed below.
18A[1]	--------	--------	--------	Good. Pilegard wrap. Pile exposed below.
18B	--------	--------	--------	Good. Pilegard wrap. Pile exposed below.
18A.A	--------	--------	--------	Good. Pilegard wrap. Pile exposed below.
18A.A[1]	--------	--------	--------	Good. Pilegard wrap. Pile exposed below.
18B.A	--------	--------	--------	Bad, 4" marine borer damage. Pilegard wrap. Pile exposed below.
18B.A[1]	--------	--------	--------	Good. Pilegard wrap. Pile exposed below.
19A	--------	--------	--------	Good. Pilegard wrap. Pile exposed below.

TABLE 5.3

RECORD OF STRUCTURAL ASSESSMENT

PIER 9

DESCRIPTION OF PILE CONDITION				
PILE	**TOP**	**MIDDLE**	**BOTTOM**	**STRUCTURAL COMMENTS**
19A[1]	--------	--------	--------	Good, 1" marine borer damage. Pilegard wrap. Pile exposed below.
19B	--------	--------	--------	Good. Pilegard wrap. Pile exposed below.
19A.A[1]	Firm	Firm	Firm	
19B.B Batter	Firm	Firm	Firm	
19D.A[1]	Firm	Firm	Firm	Small horizontal crack with bleeding at east face.
19D.B[1]	--------	--------	--------	Small horizontal crack with bleeding at west face. Vertical crack at north face.
19E.A[1]	--------	--------	--------	2'-6" sq. by 5'-4" concrete encasement at top of pile.
19E.B[1]	Firm	Firm	Firm	
19F.A[1]	Firm	Firm	Firm	
19H.B[1]	---------	---------	--------	2'-6" by 5'-4" concrete encasement at top of pile.
19H.B[1] Batter	Firm	Firm	Firm	
20A	---------	--------	--------	Good. Pilegard wrap. Pile exposed below.
20B	---------	--------	--------	Bad, 6" marine borer damage. Pilegard wrap. Pile exposed below.
21A	---------	--------	--------	Good. Pilegard wrap ripped. Pile exposed below.
21B	Good	Good	Good	Pilegard wrap ripped. Pile exposed below.

TABLE 5.3

RECORD OF STRUCTURAL ASSESSMENT

PIER 9

DESCRIPTION OF PILE CONDITION				
PILE	**TOP**	**MIDDLE**	**BOTTOM**	**STRUCTURAL COMMENTS**
22A	--------	--------	--------	Good, 1" marine borer damage. Pilegard wrap. Pile exposed below.
22B	--------	--------	--------	Bad, 6" marine borer damage. Pilegard wrap ripped. Pile exposed below.
22B	--------	--------	--------	Pier crossbeam not attached to pile. Pile split at top of pile and broken 16' below W.L.
23A	--------	--------	--------	Fair, 1 1/2" marine borer damage. Pilegard wrap ripped. Pile exposed below.
23B	--------	--------	--------	Good. Pilegard wrap ripped. Pile exposed below.
24A	--------	--------	--------	Good. Pilegard wrap ripped. Pile exposed below.
24B	--------	--------	--------	Good. Pilegard wrap ripped. Pile exposed below.
25A	--------	--------	--------	Good. Pilegard wrap. Pile exposed below.
25B	Good	Good	Good	Pile split at top connection. Pilegard wrap ripped. Pile exposed below.
26A	--------	--------	--------	Good. Pilegard wrap. Pile exposed below.
26B	--------	--------	--------	Good. Pilegard wrap. Pile exposed below.
26A.B[1]	--------	--------	--------	Shear failure at top of pile due to impact. All reinforcing is exposed.
26B.A[1] Batter	Firm	Firm	Firm	
26C.B[1] Batter	Firm	Firm	Firm	
26D.A[1]	Firm	Firm	Firm	Large crack with bleeding at east and north faces.

TABLE 5.3

RECORD OF STRUCTURAL ASSESSMENT

PIER 9

DESCRIPTION OF PILE CONDITION				
PILE	**TOP**	**MIDDLE**	**BOTTOM**	**STRUCTURAL COMMENTS**
26D.B[1]	-------	-------	--------	Shear failure at top of pile due to impact. Reinforcing is exposed.
27	-------	-------	--------	Ledger angle pulled out of concrete at pier deck.
27A	-------	-------	--------	Good. Pilegard wrap. Pile exposed below.
27B	-------	-------	--------	Good. Pilegard wrap. Pile exposed below.
28A	-------	-------	--------	Good
28B	-------	-------	--------	Good
29A	-------	-------	--------	Bad, 8" marine borer damage. Pilegard wrap ripped. Pile exposed below.
29B	-------	-------	--------	Fair, 2" marine borer damage. Pilegard wrap ripped. Pile exposed below.
30A	-------	-------	--------	Good. Pilegard wrap ripped. Pile exposed below.
30B	-------	-------	--------	Good. Pilegard wrap torn. Pile exposed below.
31A	-------	-------	--------	Good. Pilegard wrap torn. Pile exposed below.
31B	-------	-------	--------	Good. Pilegard wrap ripped. Pile exposed below.
32A	-------	-------	--------	Good. Pilegard wrap ripped. Pile exposed below.
32B	-------	-------	--------	Good. Pilegard wrap ripped. Pile exposed below.
33	-------	-------	--------	Bolt missing at longitudinal beam splice.

TABLE 5.3

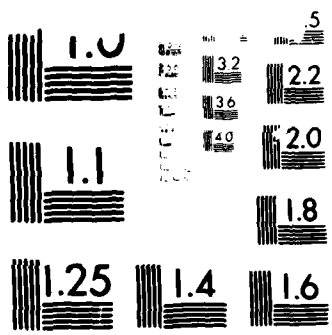
RECORD OF STRUCTURAL ASSESSMENT

PIER 9

DESCRIPTION OF PILE CONDITION				
PILE	**TOP**	**MIDDLE**	**BOTTOM**	**STRUCTURAL COMMENTS**
33A	Good	Good	Good	Pilegard wrap ripped. Pile exposed below.
33B	--------	-------	--------	Diagonal brace angles are broken.
33B	--------	-------	--------	Good, 1" marine borer damage. Pilegard wrap ripped. Pile exposed below.
34A	--------	-------	--------	Good
34B	--------	-------	--------	Good
Mooring Dolphin	--------	-------	--------	Seven pile cluster. All piles good.

5.3 COST ESTIMATE

AD-A168 495 UNDERWATER FACILITIES INSPECTIONS AND ASSESSMENTS AT 2/2
PIERS 2 7 AND 9 U S. (U) BLAYLOCK-WILLIS AND ASSOCIATES
SAN DIEGO CA DEC 84 CHES/NAVFAC-FPO-1-84(23)
UNCLASSIFIED N62477-83-D-0190 F/G 13/2 NL


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
3.2
3.6
4.0
5

ACTIVITY: NAVAL STATION SAN DIEGO, CA.
SPECIFICATION NO.
A-E FIRM NAME: BLAYLOCK-WILLIS
SHEET 1 OF 1

PROJECT TITLE: REPAIR PIER 9 AT NAVAL TRAINING CENTER
ESTIMATED BY:
CHECKED BY: Robert Whitelaw
DATE: December, 1984

STATUS:
J.O. NO.: 1644-06

DESCRIPTION	QUANTITY NUMBER	UNIT	MATERIAL COST UNIT COST	MATERIAL COST TOTAL	LABOR COST UNIT COST	LABOR COST TOTAL	ENGINEERING ESTIMATE UNIT COST	ENGINEERING ESTIMATE TOTAL
Move On-Move Off		L.S.						6,000
Disconnect & Remove 7 Damaged Wood Piles		L.S.						6,900
Replace & Connect 7 New Wood Piles		L.S.						13,800
Complete Wrapping of Partially Exposed Wood Piles		L.S.						3,400
Replace Torn Wrapping with New Material Entire Length Wood Pile		L.S.						5,900
Remove obstructing mechanical systems		L.S.						1,800
Remove deck concrete		L.S.						3,000
Pull two broken piles		L.S.						9,600
Place two new piles		L.S.						5,000
Place concrete deck patches		L.S.						1,500
Replace mechanical equipment		L.S.						1,200
Repair Cracked & Bleeding Concrete Piles		L.S.						12,000
								$70,100

5.4 BIBLIOGRAPHY

BIBLIOGRAPHY

1. San Diego Unified Port District "Environmental Impact Report on Master Plan", February, 1980, SDUPD Planning Department.

2. San Diego Unified Port District, 1982a, "Natural Physical Factors of the San Diego Tidelands", January, 1972, SDUPD Planning Department.

END

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